2015 ROADWAY IMPROVEMENT PROJECT

VARIOUS LOCATIONS

PREPARED FOR

Town of East Hartford
Department of Public Works
740 Main Street
East Hartford, CT 06108

PREPARED BY

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109
860-807-4300

February 13, 2015

Transportation
Land Development
Environmental
Services

Vanasse Hangen Brustlin, Inc.

54 Tuttle Place
Middletown, Connecticut 06457
860 632-1500
FAX 860 632-7879

Memorandum

To: Bill Anderson
VHB/Middletown

Date: October 7, 2014

Project No.: 42031.00

From: Robin Fontaine

Re: Forbes Street
East Hartford, CT

Following are the recommendations for the design and construction of Forbes Street from Forest Street to Margery Drive.

Pavement designs were conducted utilizing American Association of State Highway and Transportation Officials, "AASHTO Guide for Design of Pavement Structures, 1993", design criteria using the "Layered Analysis Thickness Design" method of component thickness of the pavement structure, traffic loadings, magnitude and frequency of loadings, material relationships, environmental considerations, soil support and the AASHTO design assumptions.

Basic design assumptions incorporated into the structural analysis were:

1. The initial serviceability will have a Road Manager Index of 96, or an AASHTO (P_0) = 4.8;
2. The terminal serviceability will be a Road Manager Index of 65, or an AASHTO (P_t) = 2.5;
3. The May 13, 2014 distress level investigation results indicate there is severe transverse/longitudinal cracking. Moderate distortions, alligator and weather/block cracking with evidence of minor pothole patching resulted in a Road Manager Pavement Condition Index (PCI) of 64.
4. A Road Manager Pavement Condition Index (PCI) of 0 indicates nearly impassible extremely poor pavement condition index, while a newly paved, perfect pavement would exhibit a condition of 100.
5. The reliability levels used for the pavement design will be 90%.
6. Roadbed soils are predominantly AASHTO A24 and classified as silty sand by the Unified Classification system. The silty sand subgrades are fair to poor foundations when not subject to frost action, having a moderate to high frost potential and exhibiting poor drainage characteristics.
7. The roadbed soils will provide some level of structural support;

MARGERY DRIVE TO SILVER LANE:

- The existing pavement structure cross-section consisted of a silty sand subbase/subgrade, 7.5" to 12" (average 9.8") of poorly graded silty sands and some Grading "A" Gravel bases with 4" to 12" (average 6.4") of HMA.
- Based on the materials evaluation and traffic, this section was found to be structurally inadequate, requiring a 2.75" overlay to meet the minimum structural design.
- The Average Daily Traffic (ADT) counted on July 22, 2014 and July 23, 2014 was found to have 9,154 vehicles per day with trucks and buses accounting for 4.62% of the ADT.

Alternative	Service Life	Recommendations
#1	20 years	MILL the existing 4" to 12" of HMA to a 4" depth, repair localized base problems, seal major cracks and tack coat prior to placing 2" of 0.5" Superpave L2 as the intermediate course and 2" of 0.5" Superpave L2 as the surface course, with a tack coat between lifts.
#2	20 years	RECLAIM the existing HMA and poorly graded silty sand and gravel bases by pulverization and blending methods to a 15" depth. Compact the recycled material to proper lines and grades, leaving 9.75" as the new base course prior to placing 3.5" of 0.5" Superpave L2 (placed in two equal lifts) as the intermediate course and 1.75" of 0.5" Superpave L2 as the surface course, with a tack coat between every lift.
#3	20 years	REMOVE the existing 4" to 12" of HMA to the poorly graded silty sand and gravel bases, add "fine" grade processed and compact to the proper lines and grades as the new base course. Then place 4.5" of 0.5" Superpave L2 (placed in two equal lifts) as the intermediate course and 2" of 0.5" Superpave L2 as the surface course, with a tack coat between every lift.

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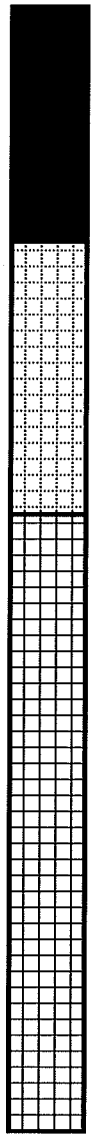
VHB *Vanasse Hangen Brustlin, Inc.*

STREET: Forbes Street - Forest Street to Margery Drive

PROJECT #: 42031.00

CITY, STATE: Town of East Hartford, CT

TP# / LOCATION: TP#1 - 100' S. of Margery Drive, 3' off SBL curb



6.5" Hot Mix Asphalt
(HMA)

7.5" poorly graded sand
with silt and gravel A-1-b

17" silty sand A-2-4

Frost Potential: moderate to high

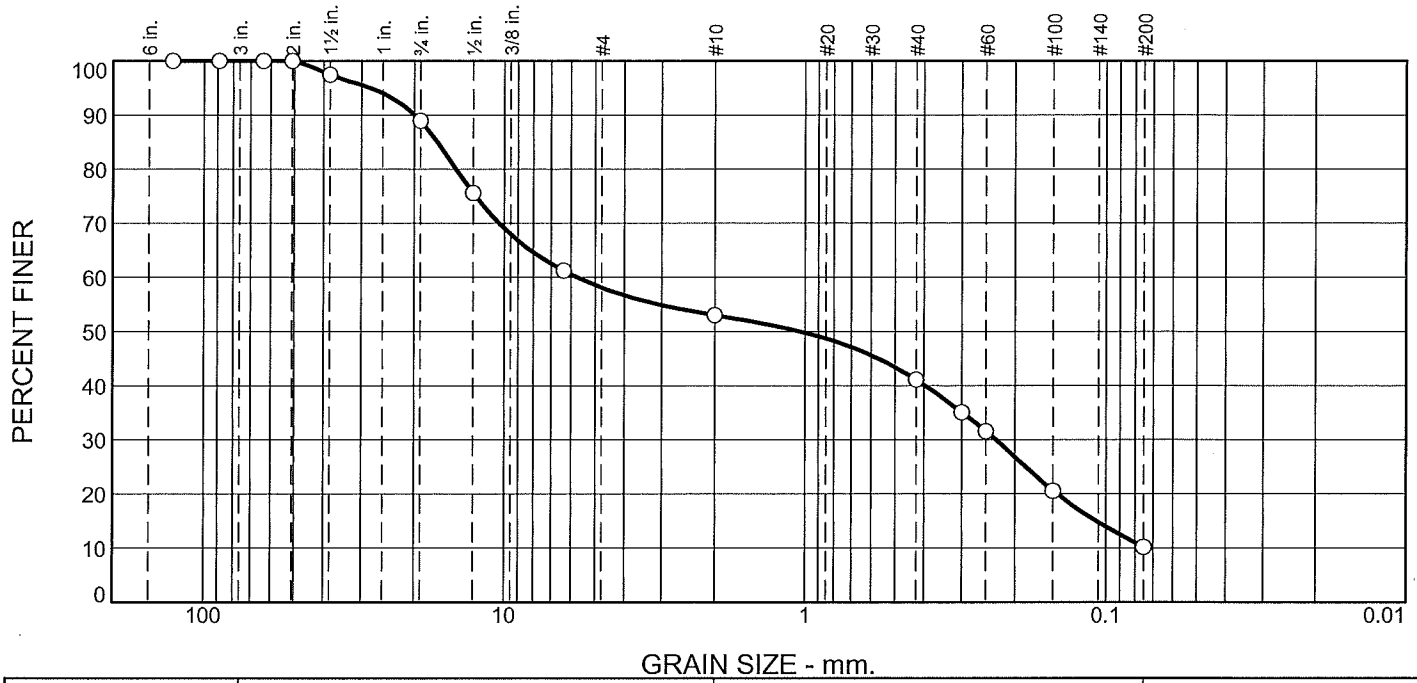
Description: This silty sand is a fair to good foundation when not subject to frost action, having a moderate to high frost potential and exhibiting fair to poor drainage characteristics.

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#1 - 100' S. of Margery Drive, 3' off SBL curb **Depth:** 7.5
Sample Number: BASE **Date:** 6/20/14



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	47	12	31	10

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	97	55 - 100	
3/4"	89		
1/2"	76		
1/4"	61	25 - 60	X
#10	53	15 - 45	X
#40	41	5 - 25	X
#50	35		
#60	32		
#100	21	0 - 10	X
#200	10	0.0 - 5.0	X

* CT - M.02.06 Gravels "A"

Material Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 16.7168 D_{60}= 5.7246 D_{50}= 1.0399
D_{30}= 0.2317 D_{15}= 0.1077 D_{10}=
C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Figure

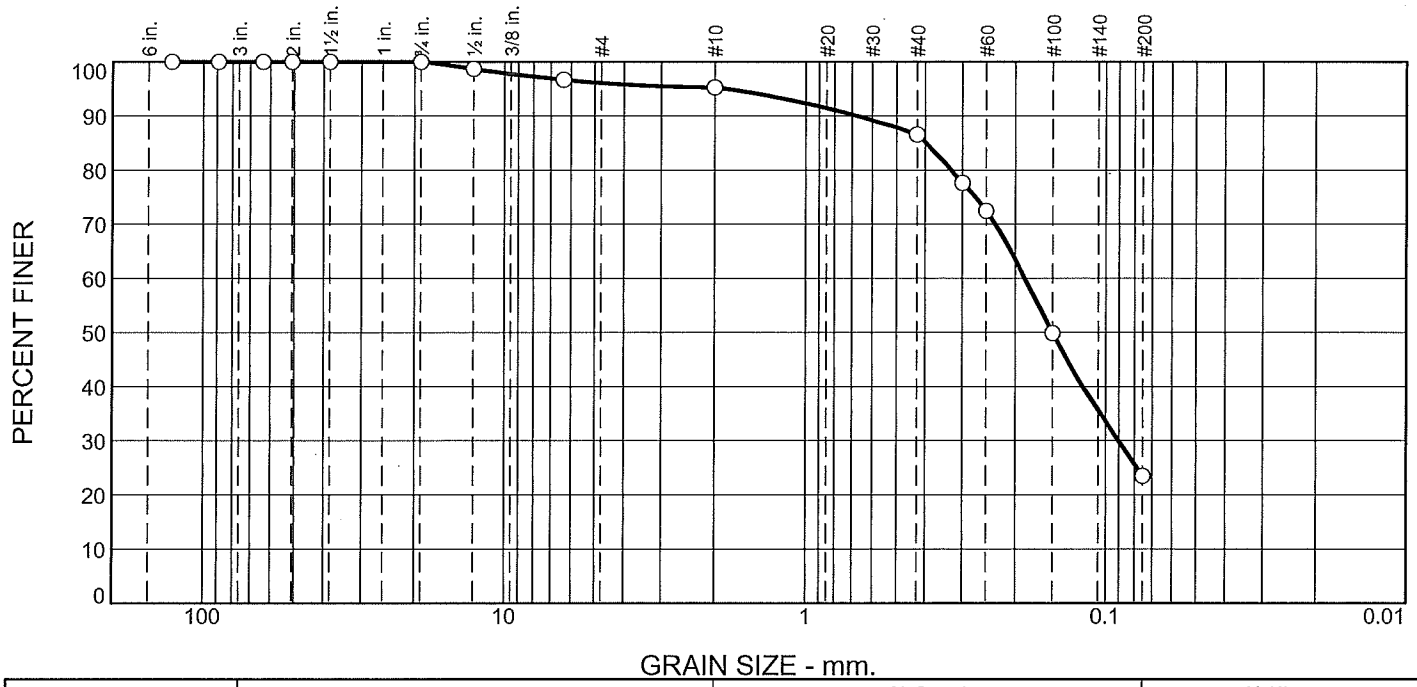
Tested By: BS/AM **Checked By:** VHB

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#1 - 100' S. of Margery Drive, 3' off SBL curb **Depth:** 17
Sample Number: SUBGRADE **Date:** 6/20/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	5	8	63	24

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	100	55 - 100	
3/4"	100		
1/2"	99		
1/4"	97	25 - 60	X
#10	95	15 - 45	X
#40	87	5 - 25	X
#50	78		
#60	72		
#100	50	0 - 10	X
#200	24	0.0 - 5.0	X

* CT - M.02.06 Gravels "A"

Material Description

silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.3973 D_{60}= 0.1856 D_{50}= 0.1503
D_{30}= 0.0904 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4

Remarks

DCP = 5" @ 5 blows;
Mr = 7621 psi;

Figure

Tested By: AM/BS **Checked By:** VHB

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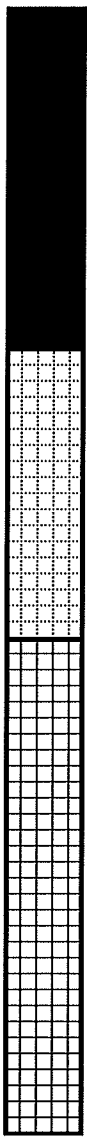
VHB *Vanasse Hangen Brustlin, Inc.*

STREET: Forbes Street - Forest Street to Margery Drive

PROJECT #: 42031.00

CITY, STATE: Town of East Hartford, CT

TP# / LOCATION: TP#2 - 445' S. of Margery Drive, 7' off SBL curb



10" Hot Mix Asphalt
(HMA)

8.5" poorly graded gravel
with silt and sand A-1-b

14.5" silty sand A-2-4

Frost Potential: moderate to high

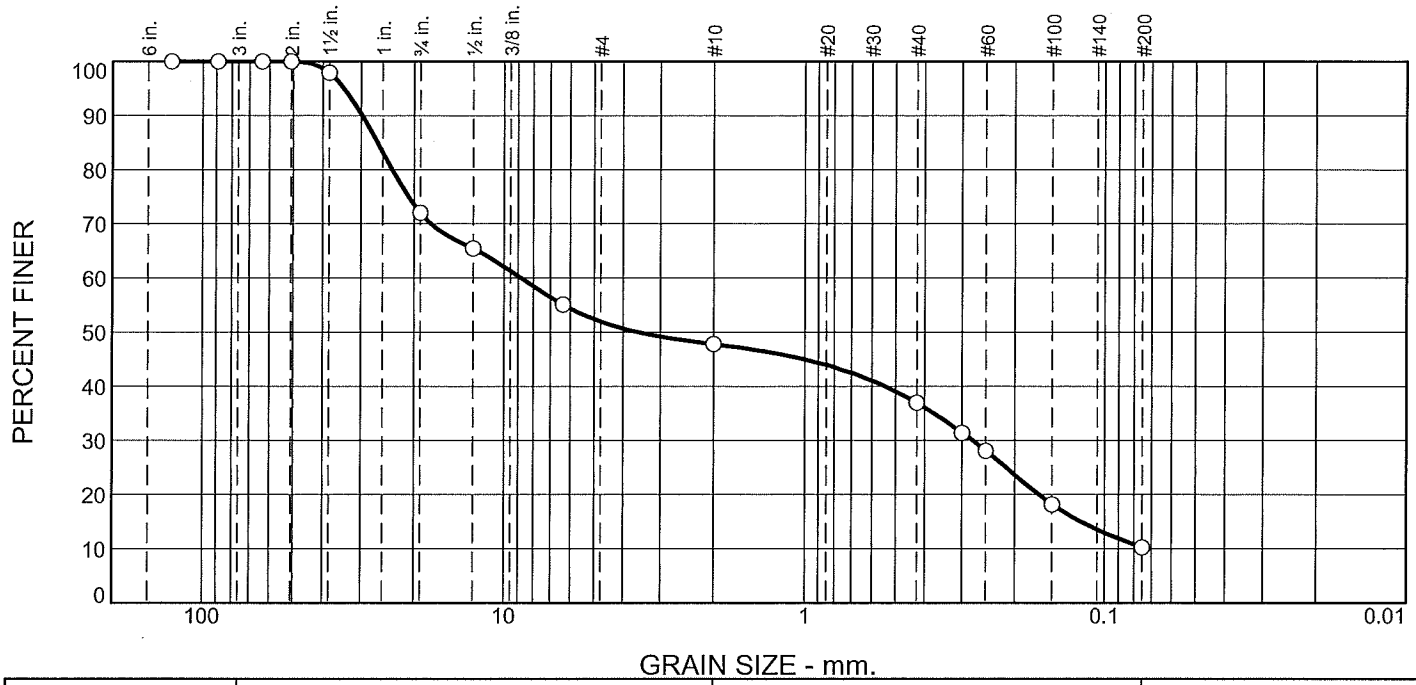
Description: This silty sand is a fair to good foundation when not subject to frost action, having a moderate to high frost potential and exhibiting fair to poor drainage characteristics.

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#2 - 445' S. of Margery Drive, 7' off SBL curb **Depth:** 8.5
Sample Number: BASE **Date:** 6/20/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	52	11	27	10

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	98	55 - 100	
3/4"	72		
1/2"	65		
1/4"	55	25 - 60	
#10	48	15 - 45	X
#40	37	5 - 25	X
#50	31		
#60	28		
#100	18	0 - 10	X
#200	10	0.0 - 5.0	X

* CT - M.02.06 Gravels "A"

Material Description

poorly graded gravel with silt and sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 26.4750 D_{60}= 8.7915 D_{50}= 3.5718
D_{30}= 0.2770 D_{15}= 0.1202 D_{10}=
C_u= C_c=

Classification

USCS= GP-GM AASHTO= A-1-b

Remarks

Figure

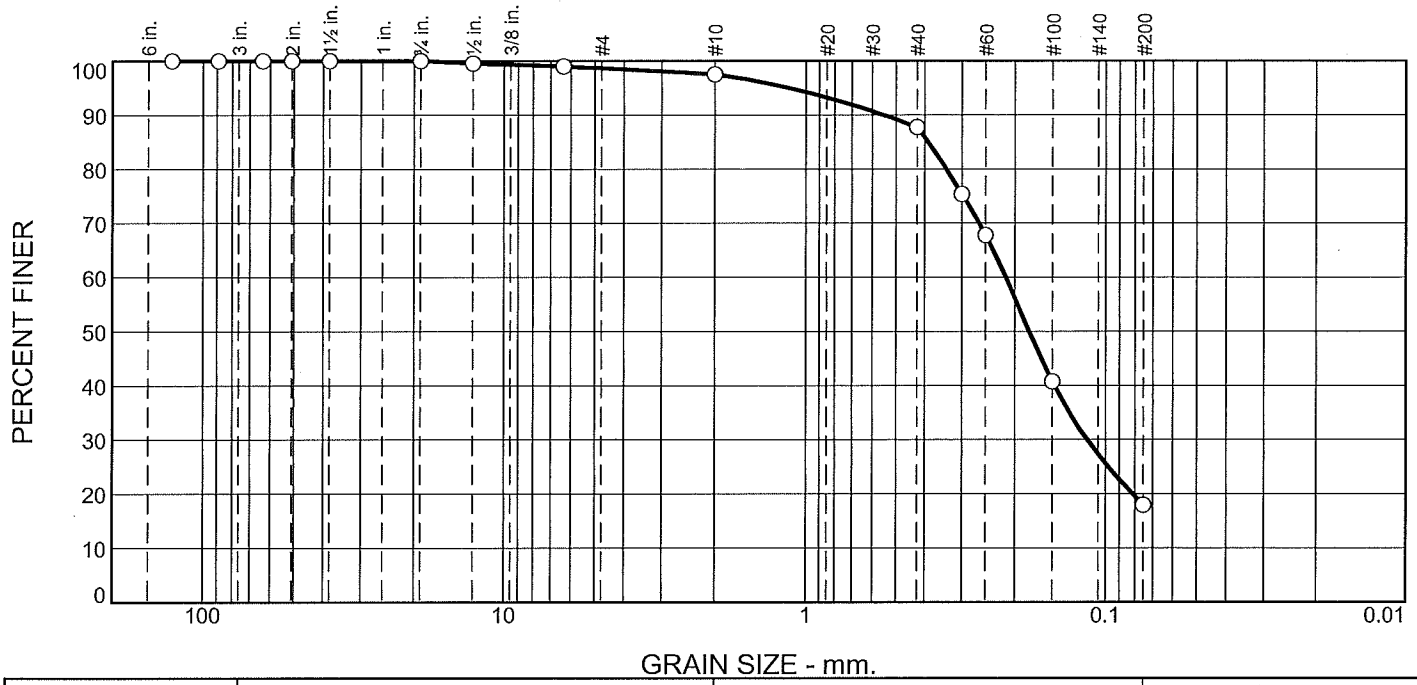
Tested By: AM/BS **Checked By:** VHB

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#2 - 445' S. of Margery Drive, 7' off SBL curb **Depth:** 14.5
Sample Number: SUBGRADE **Date:** 6/20/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	2	10	70	18

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	100	55 - 100	
3/4"	100		
1/2"	100		
1/4"	99	25 - 60	X
#10	98	15 - 45	X
#40	88	5 - 25	X
#50	75		
#60	68		
#100	41	0 - 10	X
#200	18	0.0 - 5.0	X

* CT - M.02.06 Gravels "A"

Material Description

silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.3897 D_{60}= 0.2145 D_{50}= 0.1790
D_{30}= 0.1149 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4

Remarks

DCP = 4.5" @ 5 blows;
Mr = 8722 psi;

Figure

Tested By: AM/BS **Checked By:** VHB

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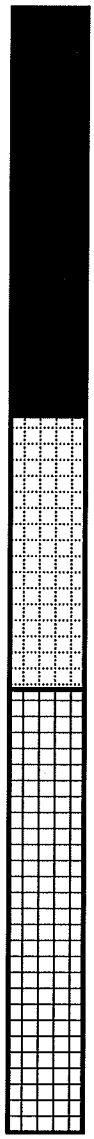
VHB *Vanasse Hangen Brustlin, Inc.*

STREET: Forbes Street - Forest Street to Margery Drive
CITY, STATE: Town of East Hartford, CT

PROJECT #: 42031.00

TP# / LOCATION: TP#3 - 410' N. of Godar Terrace, 6' off NBL curb



12" Hot Mix Asphalt
(HMA)

8" poorly graded gravel
with silt and sand A-1-b

13" silty sand A-2-4

Frost Potential: moderate to high

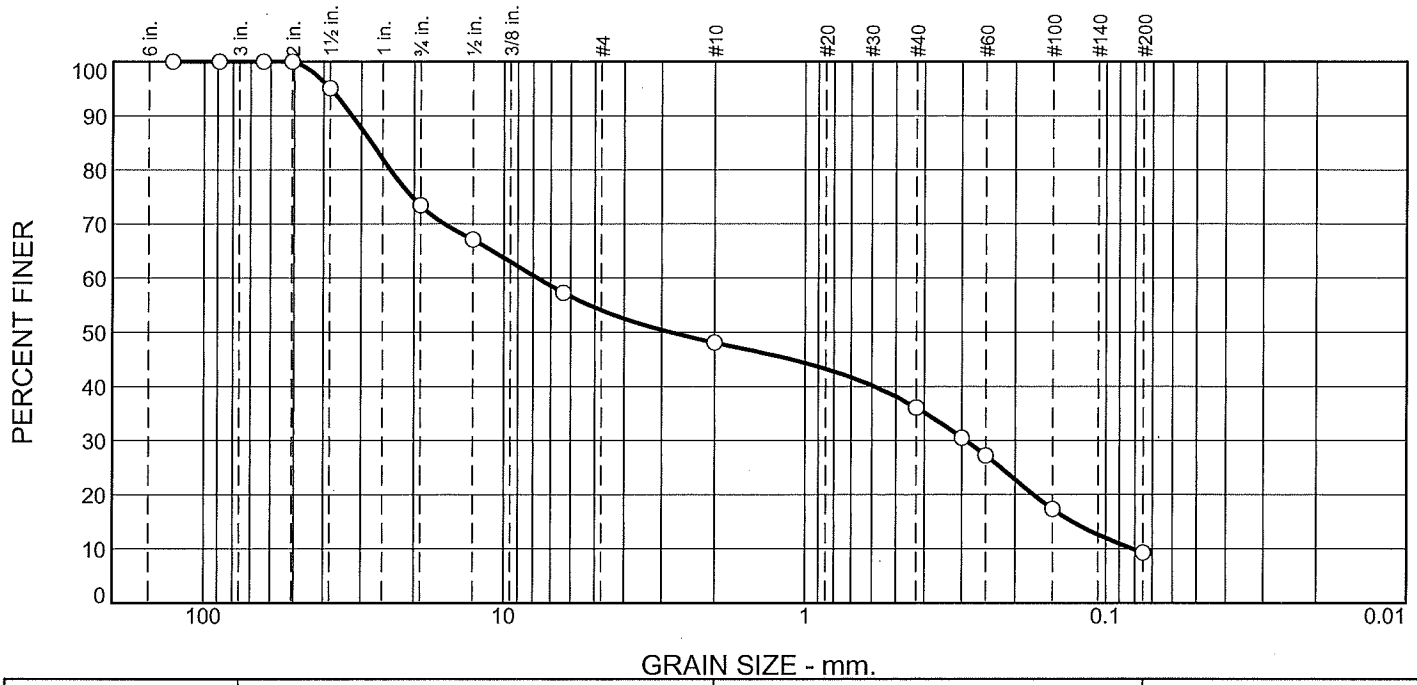
Description: This silty sand is a fair to good foundation when not subject to frost action, having a moderate to high frost potential and exhibiting fair to poor drainage characteristics.

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#3 - 410' N. of Godar Terrace, 6' off NBL curb **Depth:** 8
Sample Number: BASE **Date:** 6/20/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	52	12	27	9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	95	55 - 100	
3/4"	73		
1/2"	67		
1/4"	57	25 - 60	
#10	48	15 - 45	X
#40	36	5 - 25	X
#50	31		
#60	27		
#100	17	0 - 10	X
#200	9.3	0.0 - 5.0	X

* CT - M.02.06 Gravels "A"

Material Description

poorly graded gravel with silt and sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 27.7444 D_{60}= 7.7420 D_{50}= 2.8108
D_{30}= 0.2912 D_{15}= 0.1287 D_{10}= 0.0812
C_u= 95.31 C_c= 0.13

Classification

USCS= GP-GM AASHTO= A-1-b

Remarks

Figure

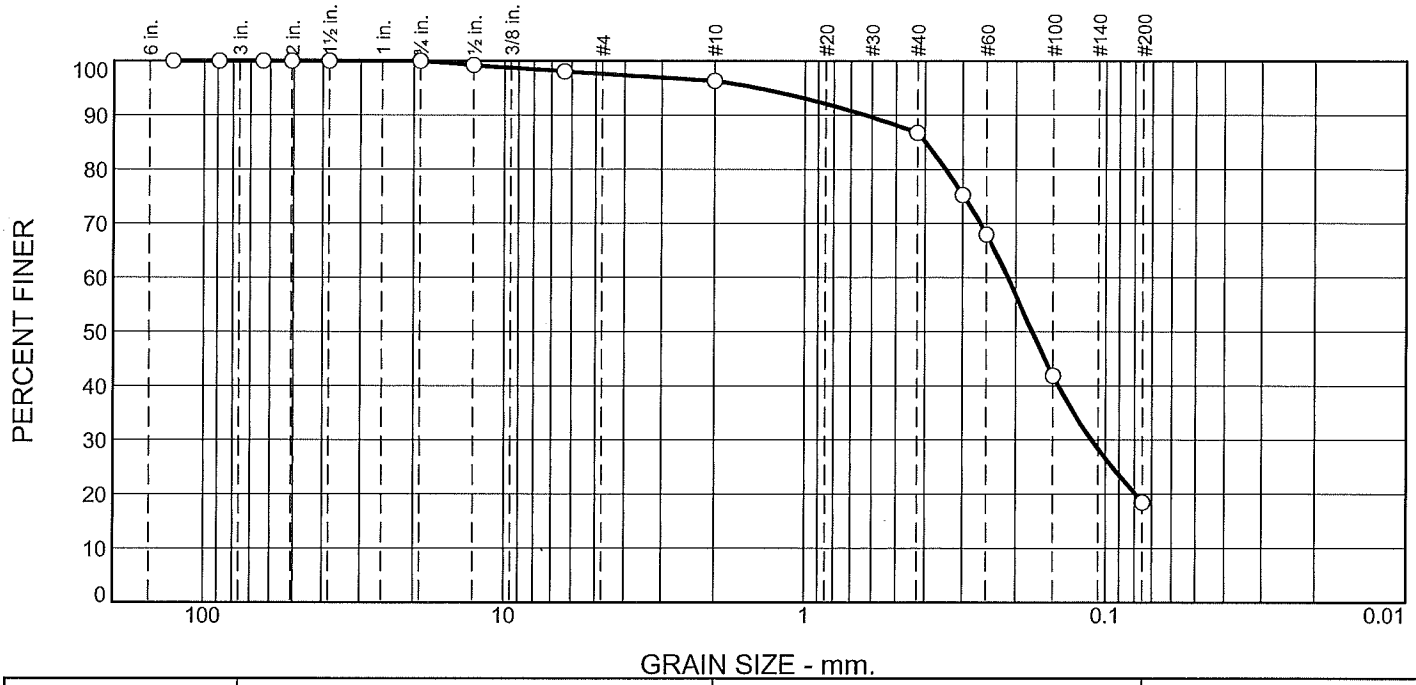
Tested By: AM/BS **Checked By:** VHB

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#3 - 410' N. of Godar Terrace, 6' off NBL curb **Depth:** 13
Sample Number: SUBGRADE **Date:** 6/20/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	4	9	69	18

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	100	55 - 100	
3/4"	100		
1/2"	99		
1/4"	98	25 - 60	X
#10	96	15 - 45	X
#40	87	5 - 25	X
#50	75		
#60	68		
#100	42	0 - 10	X
#200	18	0.0 - 5.0	X

* CT - M.02.06 Gravels "A"

Material Description

silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.3996 D_{60}= 0.2125 D_{50}= 0.1762
D_{30}= 0.1113 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4

Remarks

DCP = 5" @ 5 blows;
Mr = 7621 psi;

Figure

Tested By: AM/BS **Checked By:** VHB

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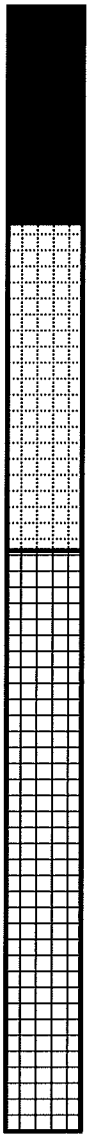
VHB *Vanasse Hangen Brustlin, Inc.*

STREET: Forbes Street - Forest Street to Margery Drive

PROJECT #: 42031.00

CITY, STATE: Town of East Hartford, CT

TP# / LOCATION: TP#4 - 65' N. of Godar Terrace, 4.5' off NBL curb



6" Hot Mix Asphalt
(HMA)

9" poorly graded sand
with silt and gravel A-3

16" poorly graded sand
with silt A-3

Frost Potential: moderate

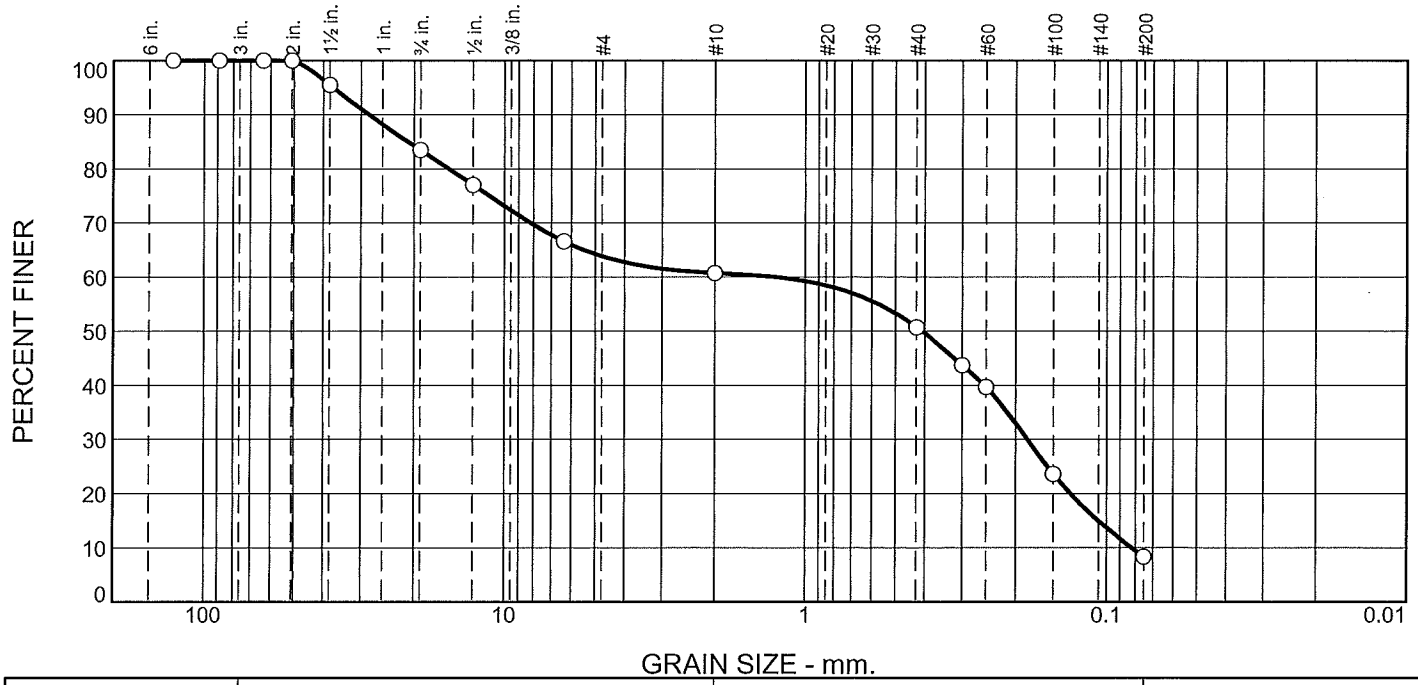
Description: This poorly graded silty sand is a fair to good foundation when not subject to frost action, having a moderate frost potential and exhibiting fair drainage characteristics.

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#4 - 65' N. of Godar Terrace, 4.5' off NBL curb **Depth:** 9
Sample Number: BASE **Date:** 6/25/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	39	10	43	8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	96	55 - 100	
3/4"	83		
1/2"	77		
1/4"	67	25 - 60	X
#10	61	15 - 45	X
#40	51	5 - 25	X
#50	44		
#60	40		
#100	24	0 - 10	X
#200	8.3	0.0 - 5.0	X

* CT - M.02.06 Gravels "A"

Material Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 20.9593 D_{60}= 1.2618 D_{50}= 0.4088
D_{30}= 0.1826 D_{15}= 0.1062 D_{10}= 0.0822
C_u= 15.35 C_c= 0.32

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Figure

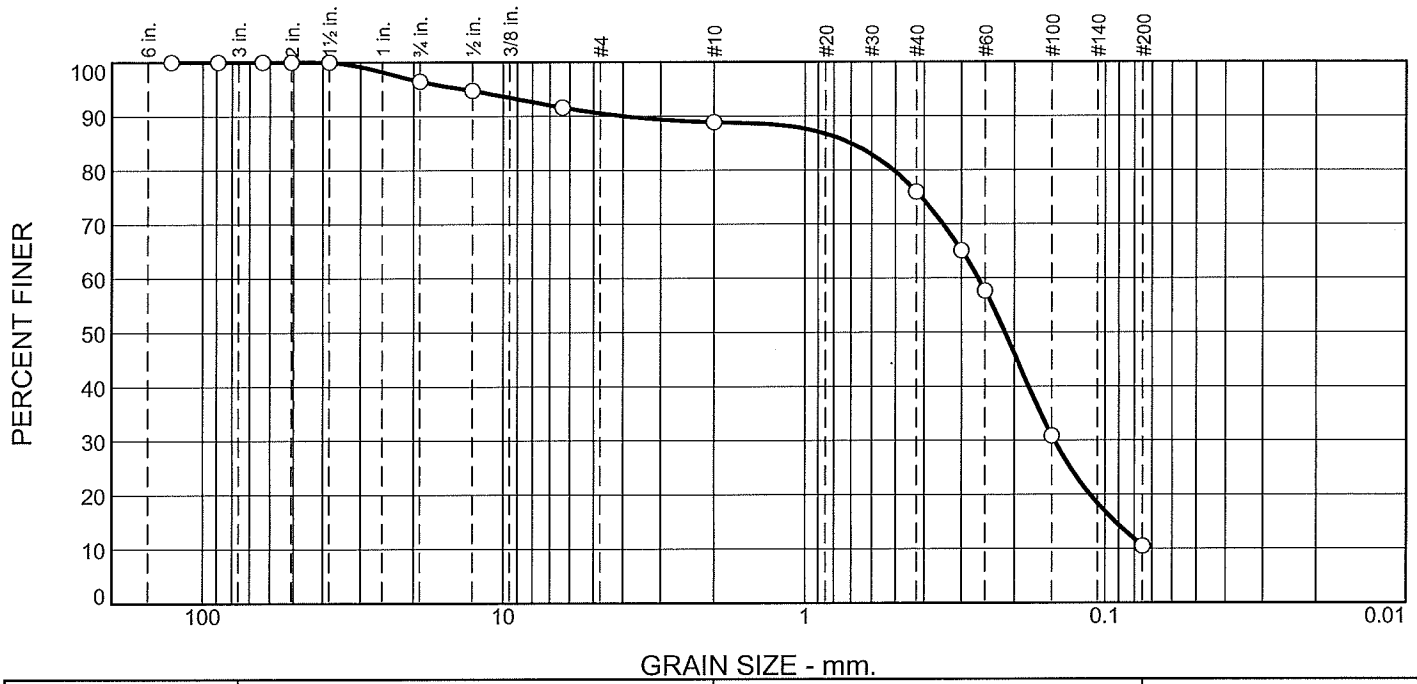
Tested By: AM/BS **Checked By:** VHB

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#4 - 65' N. of Godar Terrace, 4.5' off NBL curb **Depth:** 16
Sample Number: SUBGRADE **Date:** 6/25/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	11	13	66	10

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	100	55 - 100	
3/4"	96		
1/2"	95		
1/4"	92	25 - 60	X
#10	89	15 - 45	X
#40	76	5 - 25	X
#50	65		
#60	58		
#100	31	0 - 10	X
#200	10	0.0 - 5.0	X

* CT - M.02.06 Gravels "A"

Material Description

poorly graded sand with silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.7060 D_{60}= 0.2636 D_{50}= 0.2149
D_{30}= 0.1473 D_{15}= 0.0925 D_{10}=
C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-3

Remarks

DCP = 4" @ 5 blows;
Mr = 10,141 psi;

Figure

Tested By: AM/BS **Checked By:** VHB

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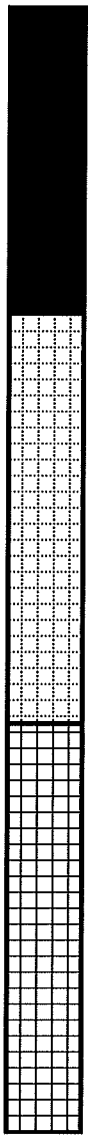
Vanasse Hangen Brustlin, Inc.

STREET: Forbes Street - Forest Street to Margery Drive

PROJECT #: 42031.00

CITY, STATE: Town of East Hartford, CT

TP# / LOCATION: TP#5 - 287' N. of Leonard Drive, 3' off SBL curb



9" Hot Mix Asphalt
(HMA)

12" Grading "A" Gravel
A-1-a

12" silty sand A-2-4

Frost Potential: moderate to high

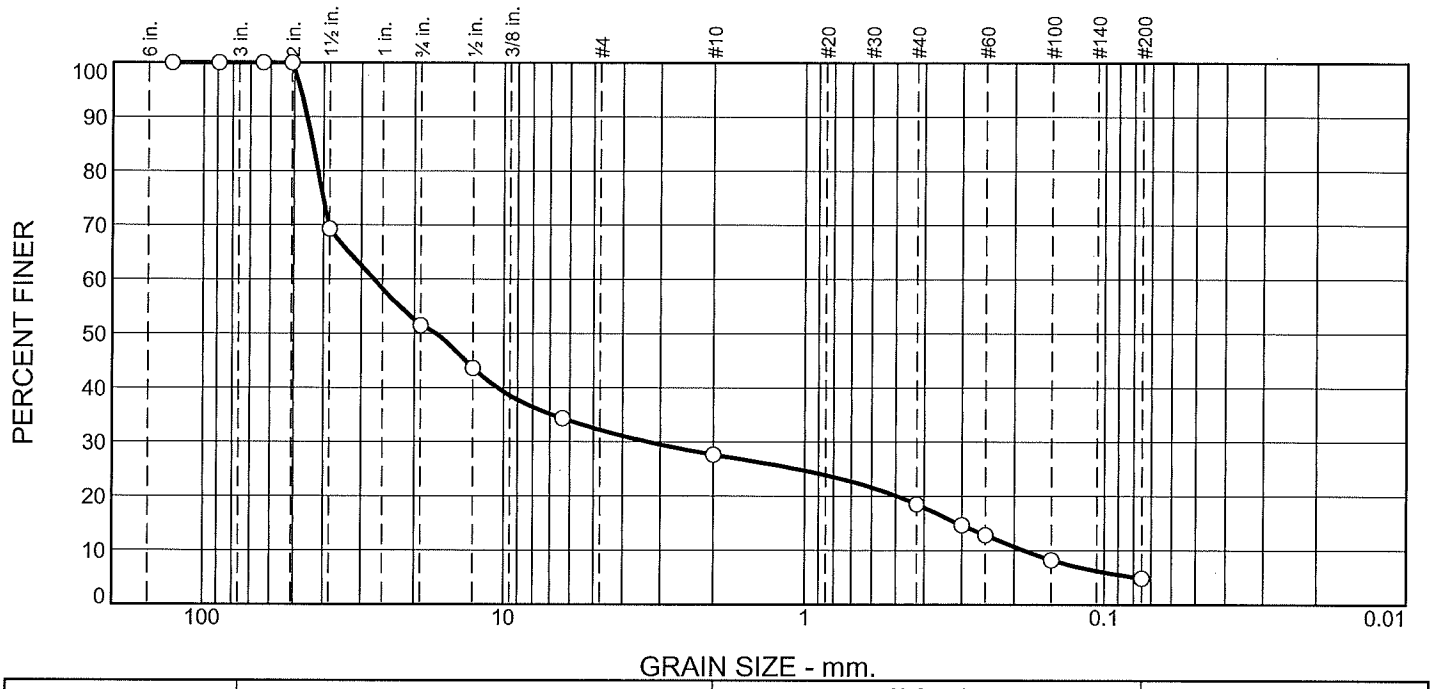
Description: This silty sand is a fair to good foundation when not subject to frost action, having a moderate to high frost potential and exhibiting fair to poor drainage characteristics.

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#5 - 287' N. of Leonard Drive, 3' off SBL curb **Depth:** 12
Sample Number: BASE **Date:** 6/25/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	72	9	14	5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	69	55 - 100	
3/4"	51		
1/2"	44		
1/4"	34	25 - 60	
#10	28	15 - 45	
#40	19	5 - 25	
#50	15		
#60	13		
#100	8	0 - 10	
#200	4.9	0.0 - 5.0	

* CT - M.02.06 Gravels "A"

Material Description

Grading "A" Gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 43.4288 D_{60}= 27.2821 D_{50}= 16.8882
D_{30}= 3.2861 D_{15}= 0.3096 D_{10}= 0.1859
C_u= 146.78 C_c= 2.13

Classification

USCS= GW AASHTO= A-1-a

Remarks

Figure

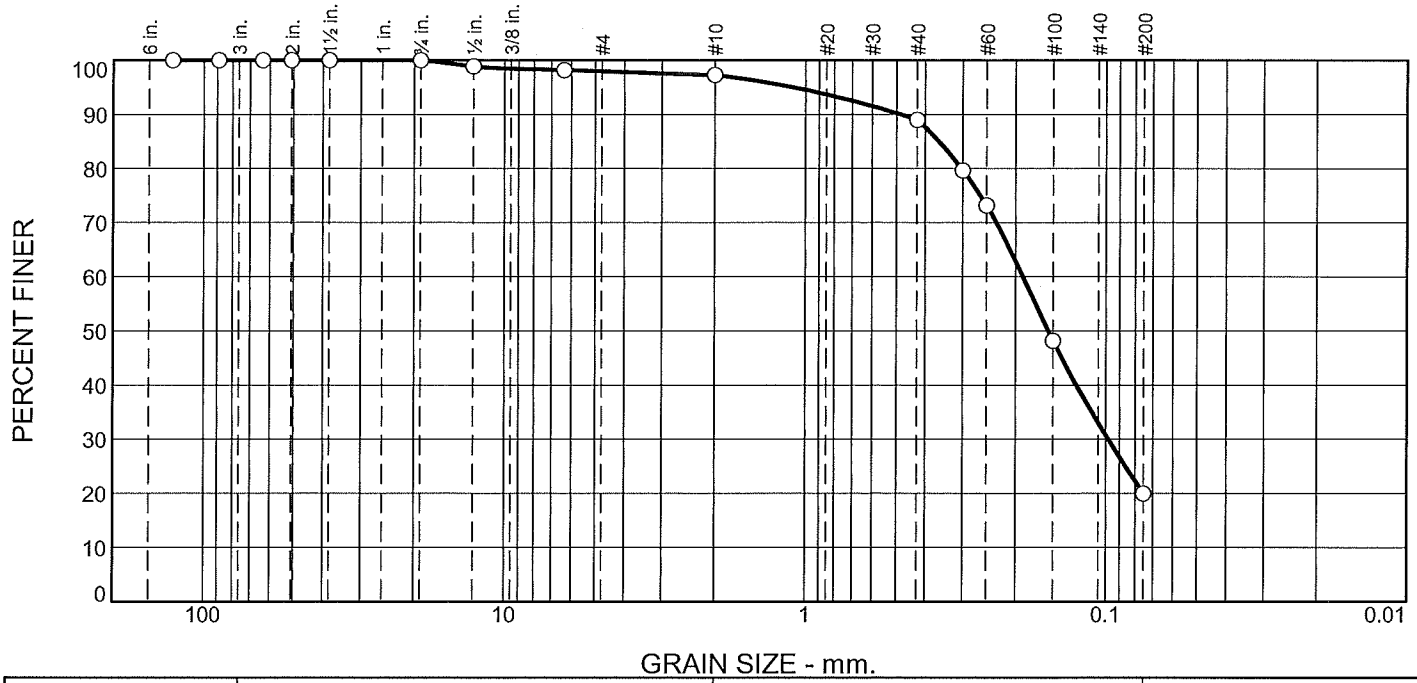
Tested By: AM/BS **Checked By:** VHB

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#5 - 287' N. of Leonard Drive, 3' off SBL curb **Depth:** 12
Sample Number: SUBGRADE **Date:** 6/25/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	3	8	69	20

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	100	55 - 100	
3/4"	100		
1/2"	99		
1/4"	98	25 - 60	X
#10	97	15 - 45	X
#40	89	5 - 25	X
#50	80		
#60	73		
#100	48	0 - 10	X
#200	20	0.0 - 5.0	X

* CT - M.02.06 Gravels "A"

Material Description

silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.3604 D_{60}= 0.1892 D_{50}= 0.1556
D_{30}= 0.0982 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4

Remarks

DCP = 4" @ 5 blows;
Mr = 10,141 psi;

Figure

Tested By: AM/BS **Checked By:** VHB

Transportation
Land Development
Environmental
Services

54 Tuttle Place
Middletown Connecticut 06457
860.632.1500
FAX 860.632.7879

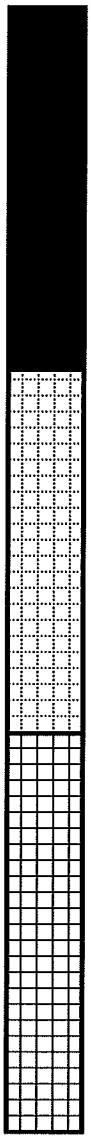
Vanasse Hangen Brustlin, Inc.

STREET: Forbes Street - Forest Street to Margery Drive

PROJECT #: 42031.00

CITY, STATE: Town of East Hartford, CT

TP# / LOCATION: TP#6 - 72' S. of Leonard Drive, 9.5' off SBL curb



10" Hot Mix Asphalt
(HMA)

10" Grading "A" Gravel
A-1-a

11" silty sand A-2-4

Frost Potential: moderate to high

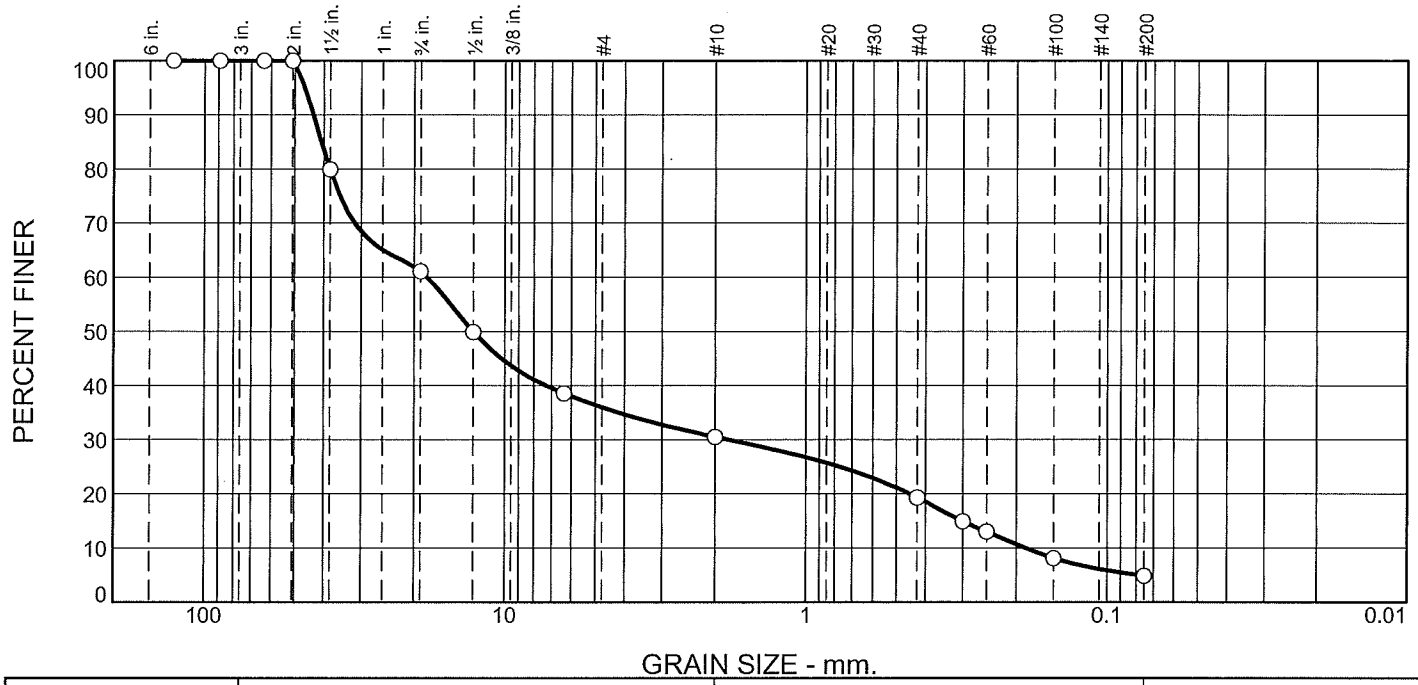
Description: This silty sand is a fair to good foundation when not subject to frost action, having a moderate to high frost potential and exhibiting fair to poor drainage characteristics.

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#6 - 72' S. of Leonard Drive, 9.5' off SBL curb **Depth:** 10
Sample Number: BASE **Date:** 6/25/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	69	12	14	5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	80	55 - 100	
3/4"	61		
1/2"	50		
1/4"	39	25 - 60	
#10	31	15 - 45	
#40	19	5 - 25	
#50	15		
#60	13		
#100	8	0 - 10	
#200	4.9	0.0 - 5.0	

* CT - M.02.06 Gravels "A"

Material Description

Grading "A" Gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 40.6846 D_{60}= 18.1293 D_{50}= 12.7450
D_{30}= 1.8107 D_{15}= 0.3022 D_{10}= 0.1859
C_u= 97.51 C_c= 0.97

Classification

USCS= GP AASHTO= A-1-a

Remarks

Figure

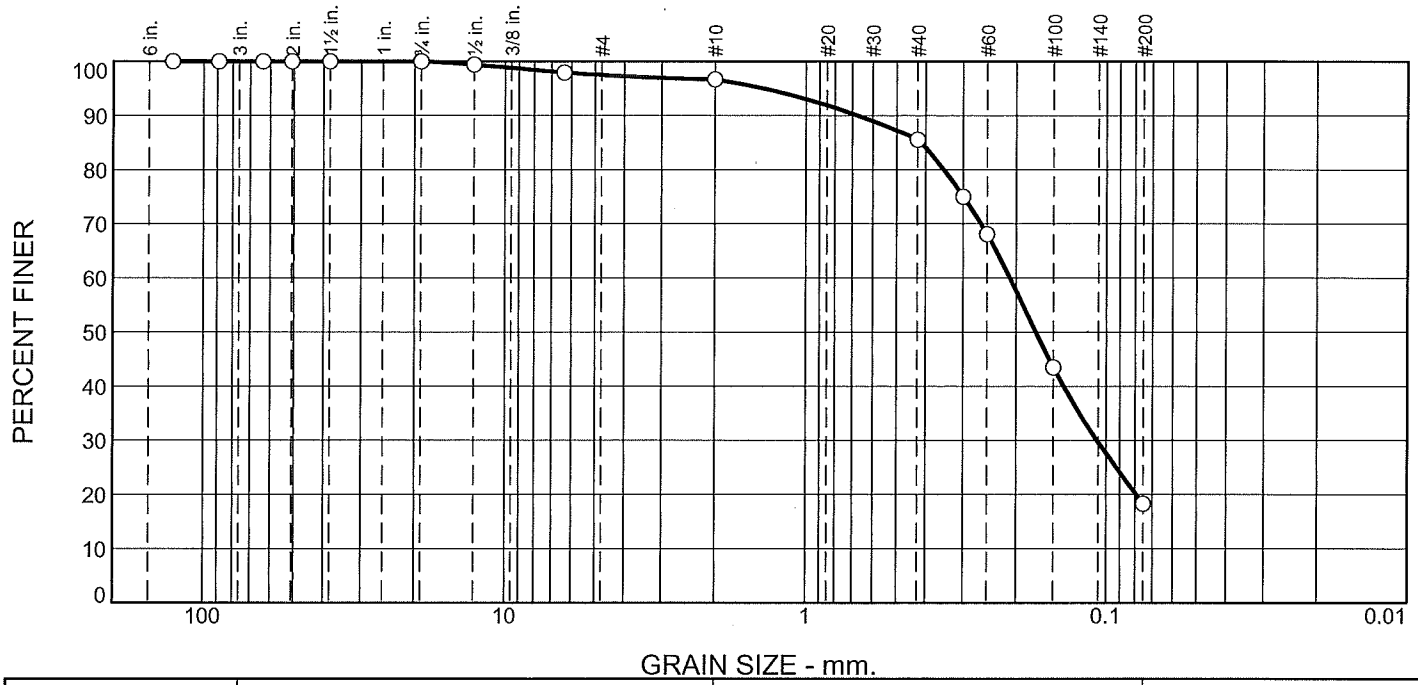
Tested By: AM/BS **Checked By:** VHB

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#6 - 72' S. of Leonard Drive, 9.5' off SBL curb **Depth:** 11
Sample Number: SUBGRADE **Date:** 6/25/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	3	11	68	18

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	100	55 - 100	
3/4"	100		
1/2"	99		
1/4"	98	25 - 60	X
#10	97	15 - 45	X
#40	86	5 - 25	X
#50	75		
#60	68		
#100	43	0 - 10	X
#200	18	0.0 - 5.0	X

* CT - M.02.06 Gravels "A"

Material Description

silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.4155 D_{60}= 0.2098 D_{50}= 0.1718
D_{30}= 0.1072 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4

Remarks

DCP = 5" @ 5 blows;
Mr = 7621 psi;

Figure

Tested By: AM/BS **Checked By:** VHB

Transportation
Land Development
Environmental
Services

54 Tuttle Place
Middletown Connecticut 06457
860.632.1500
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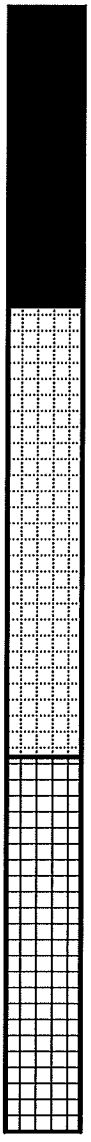
Vanasse Hangen Brustlin, Inc.

STREET: Forbes Street - Forest Street to Margery Drive

PROJECT #: 42031.00

CITY, STATE: Town of East Hartford, CT

TP# / LOCATION: TP#7 - 220' S. of Godar Terrace, 6.5' off NBL curb



8" Hot Mix Asphalt
(HMA)

12" poorly graded sand
with silt and gravel A-1-b

10" silty sand A-2-4

Frost Potential: moderate to high

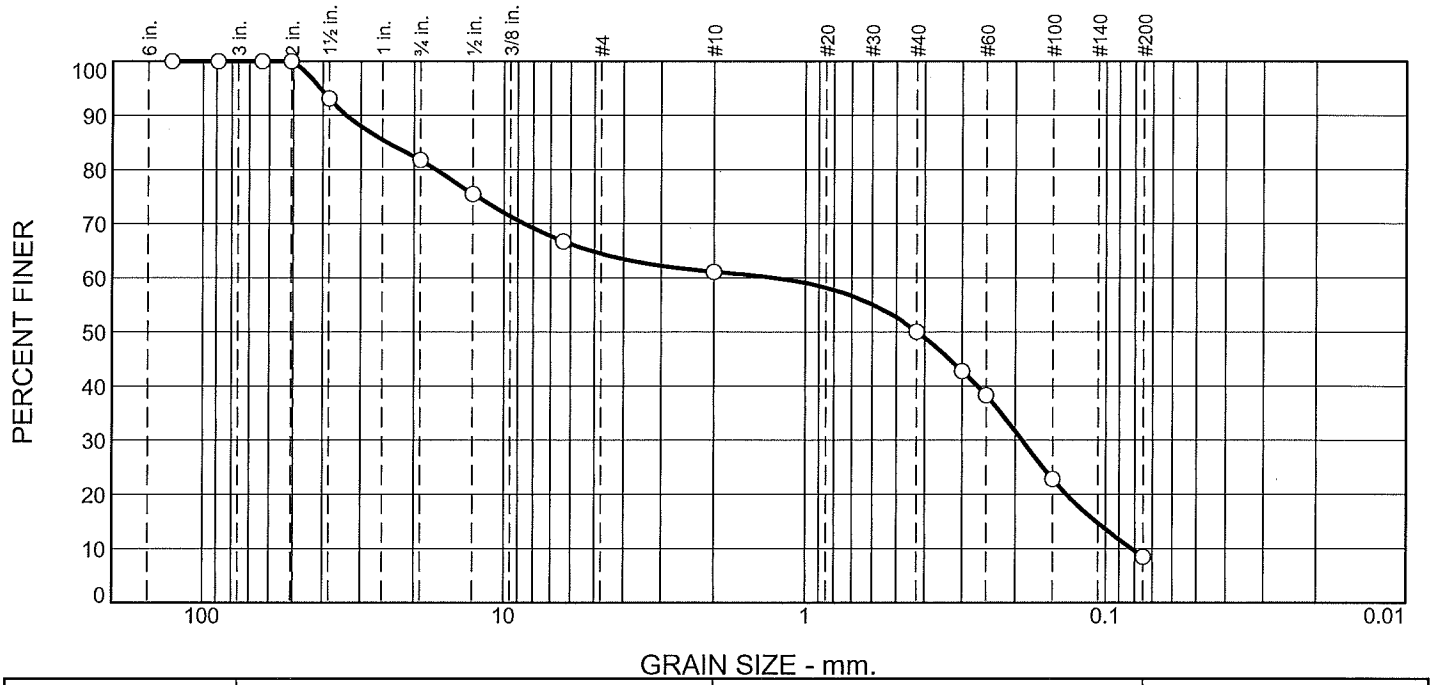
Description: This silty sand is a fair to good foundation when not subject to frost action, having a moderate to high frost potential and exhibiting fair to poor drainage characteristics.

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#7 - 220' S. of Godar Terrace, 6.5' off NBL curb **Depth:** 12
Sample Number: BASE **Date:** 6/25/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	39	11	42	8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	93	55 - 100	
3/4"	82		
1/2"	75		
1/4"	67	25 - 60	X
#10	61	15 - 45	X
#40	50	5 - 25	X
#50	43		
#60	38		
#100	23	0 - 10	X
#200	8.5	0.0 - 5.0	X

* CT - M.02.06 Gravels "A"

Material Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 24.4986 D_{60}= 1.2716 D_{50}= 0.4237
D_{30}= 0.1897 D_{15}= 0.1076 D_{10}= 0.0819
C_u= 15.52 C_c= 0.35

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Figure

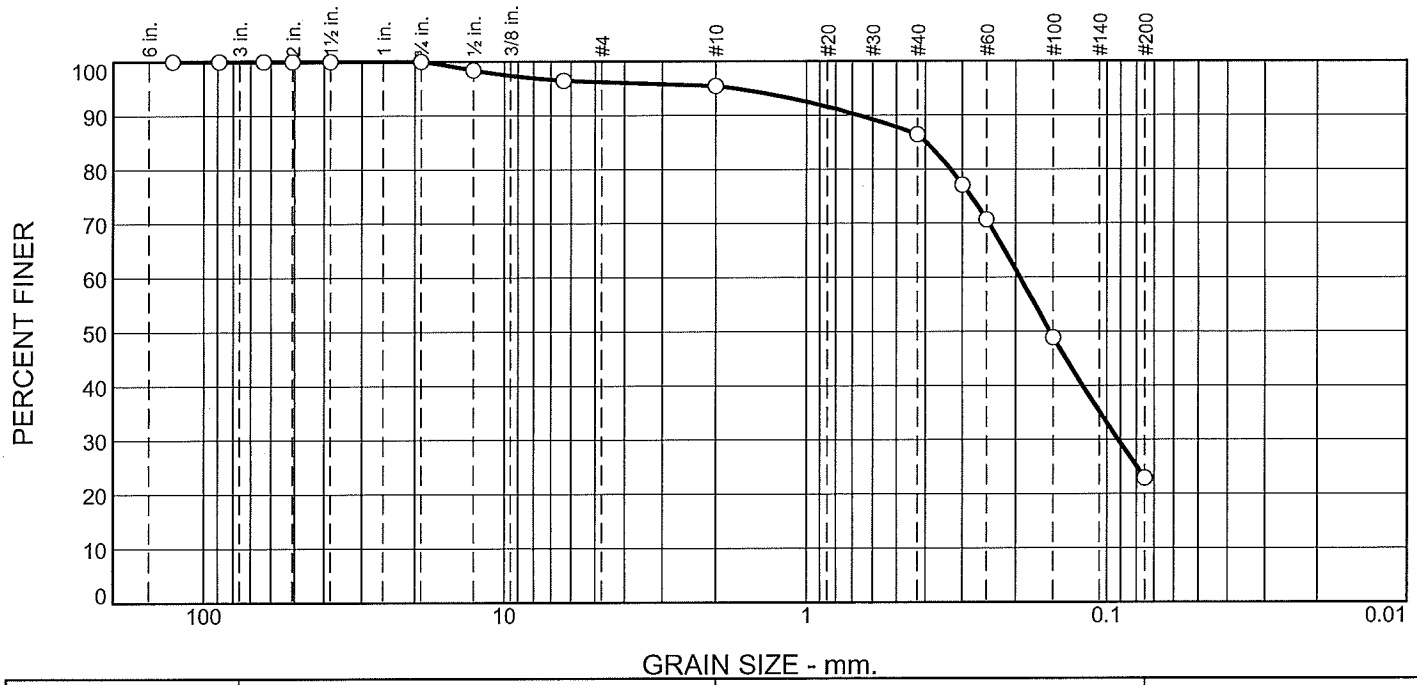
Tested By: AM/BS **Checked By:** VHB

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#7 - 220' S. of Godar Terrace, 6.5' off NBL curb **Depth:** 10
Sample Number: SUBGRADE **Date:** 6/25/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	5	9	63	23

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	100	55 - 100	
3/4"	100		
1/2"	98		
1/4"	96	25 - 60	X
#10	95	15 - 45	X
#40	86	5 - 25	X
#50	77		
#60	71		
#100	49	0 - 10	X
#200	23	0.0 - 5.0	X

* CT - M.02.06 Gravels "A"

Material Description

silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.3984 D_{60}= 0.1936 D_{50}= 0.1540
D_{30}= 0.0917 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4

Remarks

DCP = 4.5" @ 5 blows;
Mr = 8722 psi;

Figure

Tested By: AM/BS **Checked By:** VHB

Transportation
Land Development
Environmental
Services

54 Tuttle Place
Middletown Connecticut 06457
860.632.1500
FAX 860.632.7879

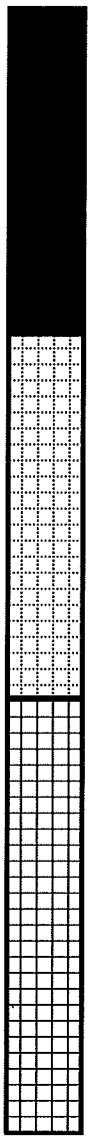
VHB *Vanasse Hangen Brustlin, Inc.*

STREET: Forbes Street - Forest Street to Margery Drive

PROJECT #: 42031.00

CITY, STATE: Town of East Hartford, CT

TP# / LOCATION: TP#8 - 447' N. of Forest Street, 2' off NBL curb



9" Hot Mix Asphalt
(HMA)

10" poorly graded sand
with silt and gravel A-1-b

12" poorly graded sand
with silt A-2-4

Frost Potential: moderate

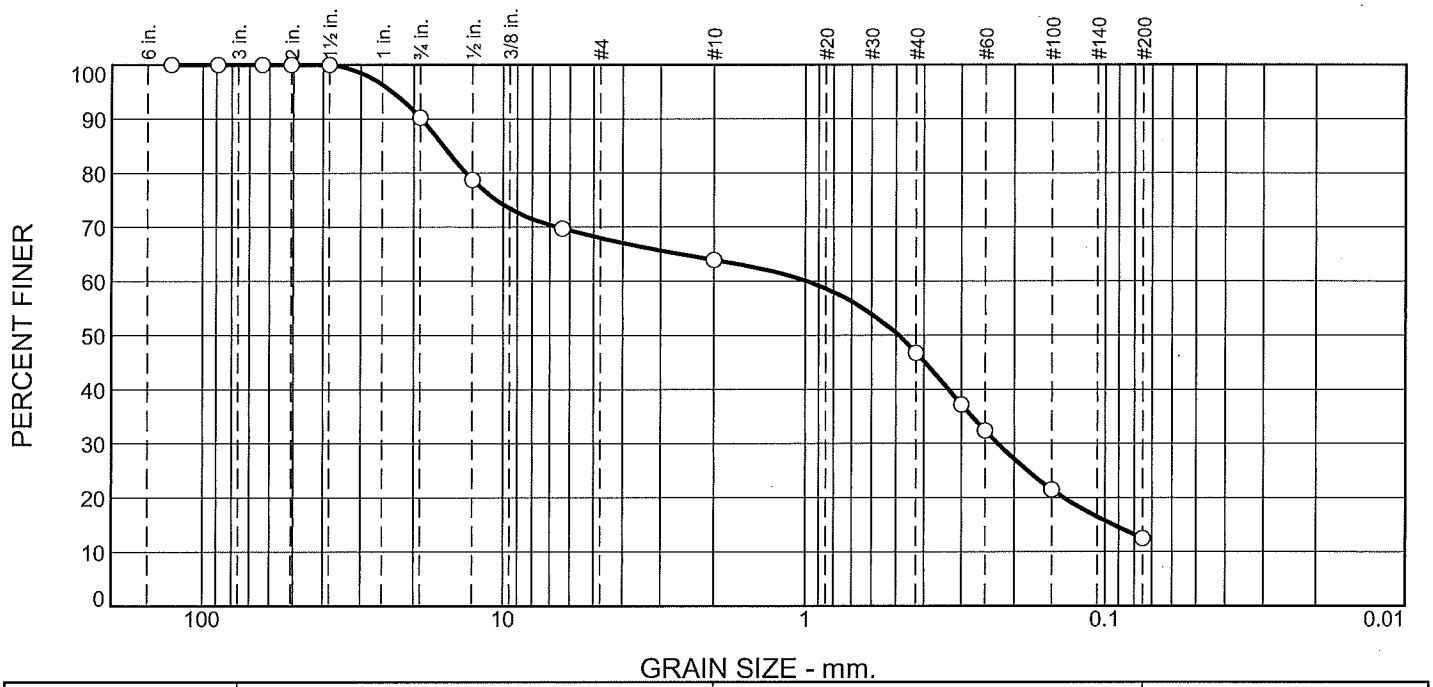
Description: This poorly graded silty sand is a fair to good foundation when not subject to frost action, having a moderate frost potential and exhibiting fair drainage characteristics.

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#8 - 447' N. of Forest Street, 2' off NBL curb **Depth:** 10
Sample Number: BASE **Date:** 6/25/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	36	17	35	12

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	100	55 - 100	
3/4"	90		
1/2"	79		
1/4"	70	25 - 60	X
#10	64	15 - 45	X
#40	47	5 - 25	X
#50	37		
#60	32		
#100	22	0 - 10	X
#200	12	0.0 - 5.0	X

* CT - M.02.06 Gravels "A"

Material Description

poorly graded sand with silt and gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 15.8737 D_{60}= 0.9864 D_{50}= 0.4884
D_{30}= 0.2266 D_{15}= 0.0939 D_{10}=
C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Figure

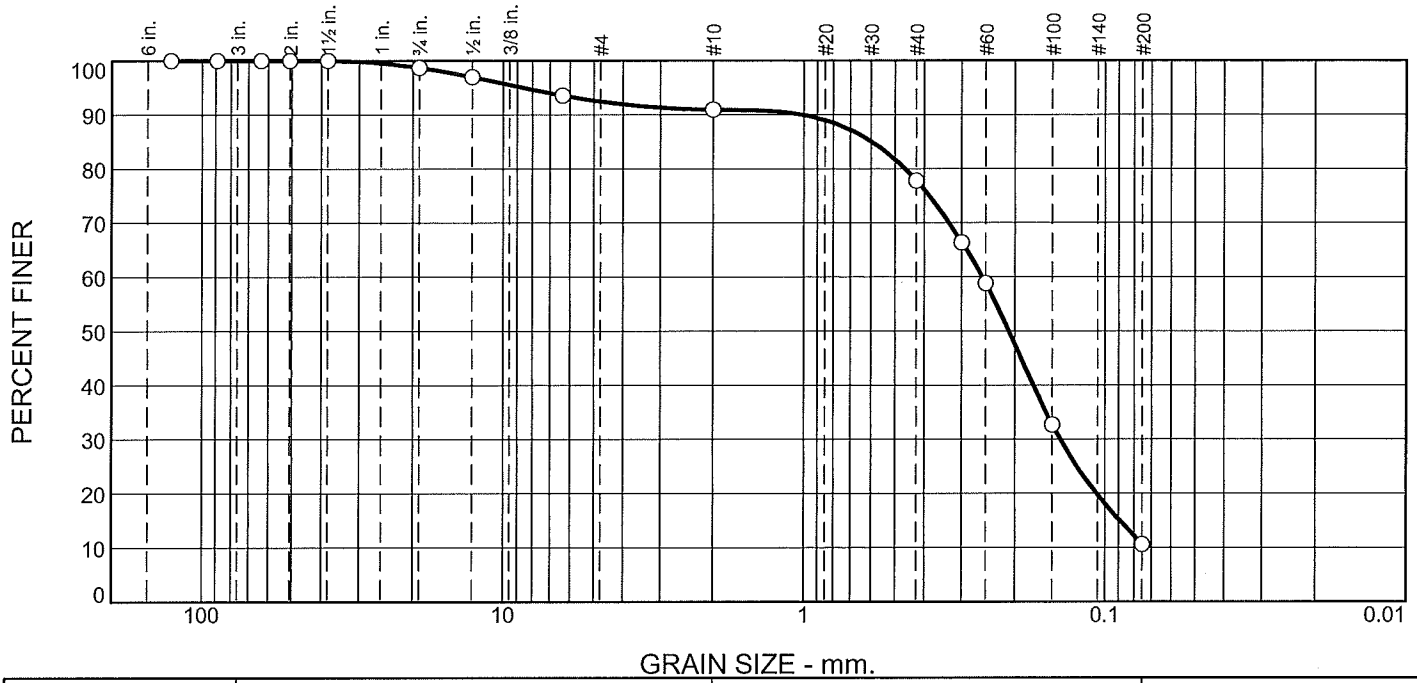
Tested By: AM/BS **Checked By:** VHB

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#8 - 447' N. of Forest Street, 2' off NBL curb **Depth:** 12
Sample Number: SUBGRADE **Date:** 6/25/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	9	13	67	11

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	100	55 - 100	
3/4"	99		
1/2"	97		
1/4"	94	25 - 60	X
#10	91	15 - 45	X
#40	78	5 - 25	X
#50	66		
#60	59		
#100	33	0 - 10	X
#200	11	0.0 - 5.0	X

* CT - M.02.06 Gravels "A"

Material Description

poorly graded sand with silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.5984 D_{60}= 0.2566 D_{50}= 0.2096
D_{30}= 0.1412 D_{15}= 0.0893 D_{10}=
C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-2-4

Remarks

DCP = 4" @ 5 blows;
Mr = 10,141 psi;

Figure

Tested By: AM/BS **Checked By:** VHB

Transportation
Land Development
Environmental
Services

54 Tuttle Place
Middletown Connecticut 06457
860.632.1500
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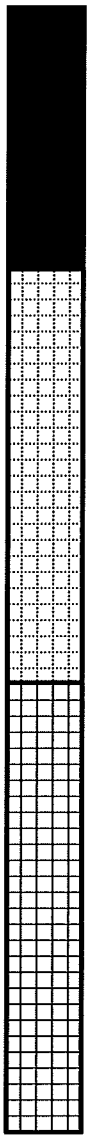
VHB *Vanasse Hangen Brustlin, Inc.*

STREET: Forbes Street - Forest Street to Margery Drive

PROJECT #: 42031.00

CITY, STATE: Town of East Hartford, CT

TP# / LOCATION: TP#9 - 102' N. of Forest Street, 2.5' off SBL curb



7" Hot Mix Asphalt
(HMA)

11" Grading "A" Gravel
A-1-a

12" poorly graded sand
with silt A-3

Frost Potential: moderate

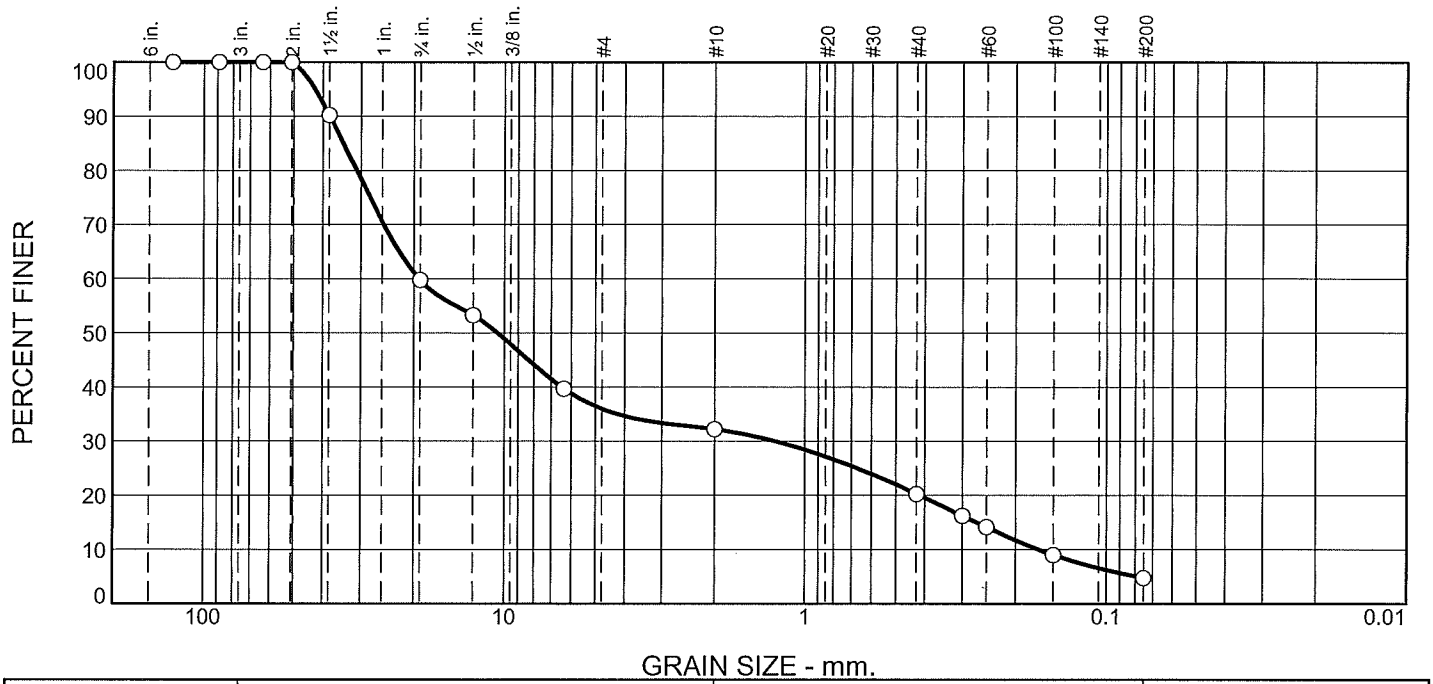
Description: This poorly graded silty sand is a fair to good foundation when not subject to frost action, having a moderate frost potential and exhibiting fair drainage characteristics.

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#9 - 102' N. of Forest Street, 2.5' off SBL curb **Depth:** 11
Sample Number: BASE **Date:** 6/25/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	68	12	15	5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	90	55 - 100	
3/4"	60		
1/2"	53		
1/4"	40	25 - 60	
#10	32	15 - 45	
#40	20	5 - 25	
#50	16		
#60	14		
#100	9	0 - 10	
#200	4.7	0.0 - 5.0	

* CT - M.02.06 Gravels "A"

Material Description

Grading "A" Gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 34.1706 D_{60}= 19.1981 D_{50}= 10.5458
D_{30}= 1.2547 D_{15}= 0.2700 D_{10}= 0.1678
C_u= 114.41 C_c= 0.49

Classification

USCS= GP AASHTO= A-1-a

Remarks

Figure

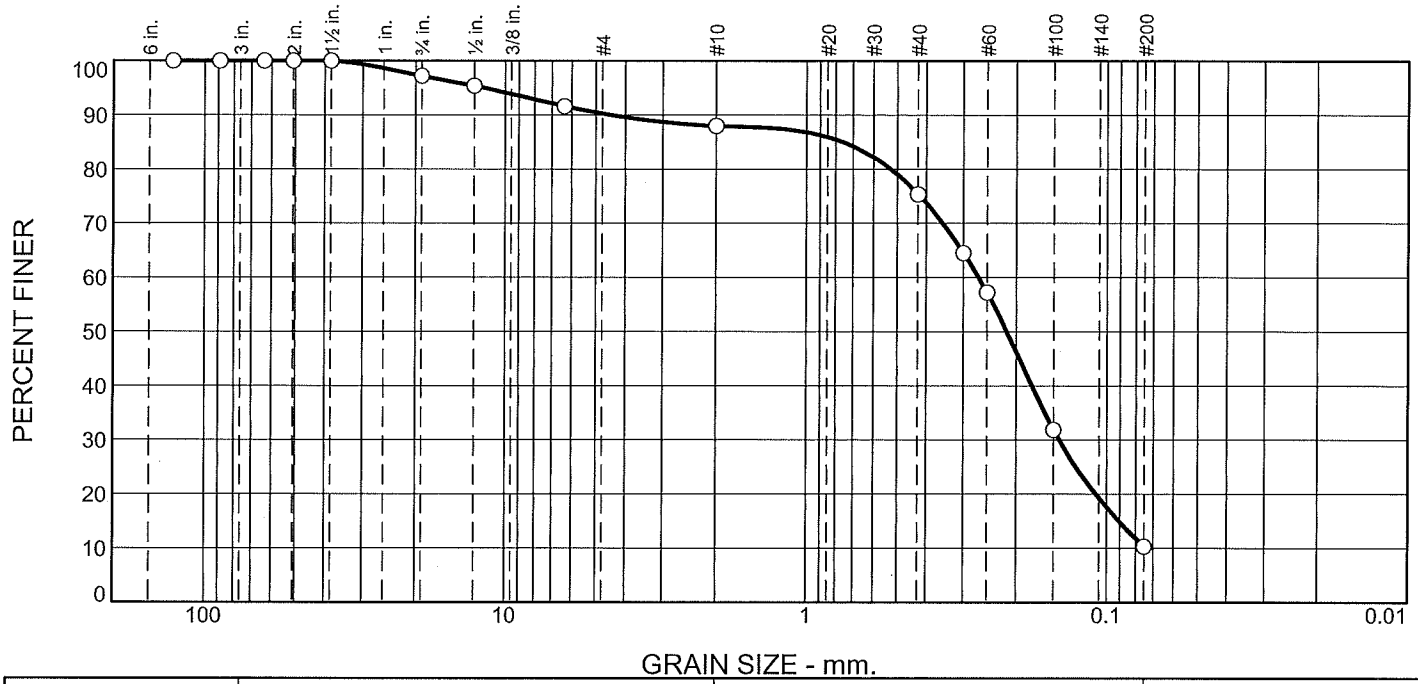
Tested By: AM/BS **Checked By:** VHB

Vanasse Hangen Brustlin, Inc.

Project: Forbes Street - Forest Street to Margery Drive **Project No.:** 42031.00

Client: Town of East Hartford, CT

Source of Sample: TP#9 - 102' N. of Forest Street, 2.5' off SBL curb **Depth:** 12
Sample Number: SUBGRADE **Date:** 6/25/2014



% +3"	% Gravel	% Sand		% Fines
		Coarse	Fine	Silt
0	12	13	65	10

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
3-1/2"	100	100	
2-1/2"	100		
2"	100		
1-1/2"	100	55 - 100	
3/4"	97		
1/2"	95		
1/4"	92	25 - 60	X
#10	88	15 - 45	X
#40	75	5 - 25	X
#50	64		
#60	57		
#100	32	0 - 10	X
#200	10	0.0 - 5.0	X

* CT - M.02.06 Gravels "A"

Material Description

poorly graded sand with silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.7583 D_{60}= 0.2669 D_{50}= 0.2151
D_{30}= 0.1436 D_{15}= 0.0907 D_{10}=
C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-3

Remarks

DCP = 4.5" @ 5 blows;
Mr = 8722 psi;

Figure

Tested By: AM/BS **Checked By:** VHB

Planning | Transportation | Land Development | Environmental Services

CORE PROFILE

Creating results for our clients and benefits for our communities

LOCATION: Forbes Street - East Hartford, CT
DATE SAMPLED: Wednesday, June 25, 2014

FROM: Forest Street
TO: Margery Drive

CORE#: 1 **Area:** *100' N. of Forest St., 5' off NBL curb (House # 951)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
 177	7.07	Hot Mix Asphalt (HMA)	*Poor Bond @ 6.02"*
		Sandy Gravel	

CORE#: 2 **Area:** *180' N. of Forest St., Centerline (House # 844)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
 158	6.31	Hot Mix Asphalt	*Poor Bond @ 2.13"*
		Sandy Gravel	

CORE#: 3 **Area:** *260' N. of Forest St., 3' off SBL curb (House # 844)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
 162	6.47	Hot Mix Asphalt	
		Sandy Gravel	

CORE#: 4 **Area:** *340' N. of Forest St., 2' off NBL curb (House # 844)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
 171	6.85	Hot Mix Asphalt	*Poor Bond @ 4.92"*
		Sandy Gravel	

Vanasse Hangen Brustlin, Inc.
14 Industrial Park Place
Middletown, Connecticut 06457
860.807.4300 ▪ FAX 860.632.1456
www.vhb.com

CORE PROFILE

LOCATION: Forbes Street - East Hartford, CT
DATE SAMPLED: June 25, 2014

FROM: Forest Street
TO: Margery Drive

CORE#: 5 ***Area:*** *420' N. of Forest St., Centerline (House # 930)*

	***DEPTH*** mm	inches	***CLASSIFICATION***	
	166	6.64	Hot Mix Asphalt	
			Sandy Gravel	

CORE#: 6 ***Area:*** *500' N. of Forest St., 5' off SBL curb (House # 924)*

	***DEPTH*** mm	inches	***CLASSIFICATION***	
	101	4.05	Hot Mix Asphalt	
			Sandy Gravel	

CORE#: 7 ***Area:*** *590' N. of Forest St., 5' off SBL curb (House # 920)*

	***DEPTH*** mm	inches	***CLASSIFICATION***	
	183	7.31	Hot Mix Asphalt	*Poor Bond @ 5.41"*
			Sandy Gravel	

CORE#: 8 ***Area:*** *660' N. of Forest St., Centerline (House # 914)*

	***DEPTH*** mm	inches	***CLASSIFICATION***	
	151	6.04	Hot Mix Asphalt	*Poor Bond @ 2.42"*
			Sandy Gravel	

CORE#: 9 ***Area:*** *740' N. of Forest St., 4' off SBL curb (House # 907)*

	***DEPTH*** mm	inches	***CLASSIFICATION***	
	135	5.39	Hot Mix Asphalt	
			Sandy Gravel	

CORE PROFILE

LOCATION: Forbes Street - East Hartford, CT FROM: Forest Street
DATE SAMPLED: June 25, 2014 TO: Margery Drive

CORE#: 10 ***Area:*** *820' N. of Forest St., 4' off NBL curb (House # 901)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
			
118	4.72	Hot Mix Asphalt	
		Sandy Gravel	

CORE#: 11 ***Area:*** *900' N. of Forerst St., Centerline (House # 892)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
			
136	5.44	Hot Mix Asphalt	
		Sandy Gravel	

CORE#: 12 ***Area:*** *980' N. of Forest St., 3' off SBL curb (House # 892)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
			
113	4.53	Hot Mix Asphalt	
		Sandy Gravel	

CORE#: 13 ***Area:*** *1060' N. of Forest St., 3' off NBL curb (House # 880)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
			
134	5.34	Hot Mix Asphalt	
		Sandy Gravel	

CORE#: 14 ***Area:*** *1140' N. of Forest st., Centerline (House # 870)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
			
152	6.08	Hot Mix Asphalt	*Poor Bond @ 2.77"*
		Sandy Gravel	

CORE PROFILE

LOCATION: Forbes Street - East Hartford, CT
DATE SAMPLED: June 25, 2014

FROM: Forest Street
TO: Margery Drive

CORE#: 15 ***Area:*** *1220' N. of Forest St., 2' off SBl curb (House # 864)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
165	6.58	Hot Mix Asphalt	
		Sandy gravel	

CORE#: 16 ***Area:*** *1300' N. of Forest St., 4' off NBL curb (House # 862)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
140	5.60	Hot Mix Asphalt	
		Sandy Gravel	

CORE#: 17 ***Area:*** *1380' N. of Forest St., Centerline (House # 854)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
138	5.53	Hot Mix Asphalt	*Poor Bond @ 3.96"*
		Sandy Gravel	

CORE#: 18 ***Area:*** *1460' N. of Forest St., 6' off SBL curb (House # 852)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
140	5.59	Hot Mix Asphalt	
		Sandy Gravel	

CORE#: 19 ***Area:*** *1540' N. of Forest St., 2' off NBL curb (House # 850)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
140	5.59	Hot Mix Asphalt	*Poor Bond @ 3.62"*
		Sandy Gravel	

CORE PROFILE

LOCATION: Forbes Street - East Hartford, CT FROM: Forest Street
DATE SAMPLED: June 25, 2014 TO: Margery Drive

CORE#: 20 ***Area:*** *1620' N. of Forest St., Centerline (House # 836)*

	DEPTH mm	DEPTH inches	CLASSIFICATION	
	129	5.15	Hot Mix Asphalt	
			Sandy Gravel	

CORE#: 21 ***Area:*** *1700' N. of Forest St., 5' off SBL curb (House # 834)*

	DEPTH mm	DEPTH inches	CLASSIFICATION	
	125	4.99	Hot Mix Asphalt	*Poor Bond @ 2.60"*
			Sandy Gravel	

CORE#: 22 ***Area:*** *1780' N. of Forest St., 4' off NBL curb (House # 822)*

	DEPTH mm	DEPTH inches	CLASSIFICATION	
	131	5.25	Hot Mix Asphalt	*Poor Bond @ 2.13"*
			Sandy Gravel	

CORE#: 23 ***Area:*** *1860' N. of Forest St., Centerline (House # 812)*

	DEPTH mm	DEPTH inches	CLASSIFICATION	
	207	8.27	Hot Mix Asphalt	*Poor Bond @ 1.92"*
			Sandy Gravel	

CORE#: 24 ***Area:*** *1940' N. of Forest St., 3' off SBL curb (House # 815)*

	DEPTH mm	DEPTH inches	CLASSIFICATION	
	126	5.02	Hot Mix Asphalt	
			Sandy Gravel	

CORE PROFILE

LOCATION: Forbes Street - East Hartford, CT
DATE SAMPLED: June 25, 2014

FROM: Forest Street
TO: Margery Drive

CORE#: 25 ***Area:*** *2020' N. of Forest St., 3' off NBL curb (House # 802)*

	***DEPTH*** mm	inches	***CLASSIFICATION***	
	131	5.24	Hot Mix Asphalt	
			Dsandy Gravel	

CORE#: 26 ***Area:*** *2100' N. of Forest St., Centerline (House # 793)*

	***DEPTH*** mm	inches	***CLASSIFICATION***	
	214	8.56	Hot Mix Asphalt	*Poor Bond @ 1.93"*
			Sandy Gravel	

CORE#: 27 ***Area:*** *2180' N. of Forest St., 5' off SBL curb (House # 790)*

	***DEPTH*** mm	inches	***CLASSIFICATION***	
	141	5.64	Hot Mix Asphalt	*(In Patch)*
			Sandy Gravel	

CORE#: 28 ***Area:*** *2260' N. of Forest St., 1' off NBL curb (House # 784)*

	***DEPTH*** mm	inches	***CLASSIFICATION***	
	112	4.49	Hot Mix Asphalt	*Poor Bond @ 1.86"*
			Sandy Gravel	

CORE#: 29 ***Area:*** *2340' N. of Forest St., Centerline (House # 782)*

	***DEPTH*** mm	inches	***CLASSIFICATION***	
	139	5.57	Hot Mix Asphalt	*Poor Bond @ 1.60"*
			Sandy Gravel	

VHB

CORE PROFILE

LOCATION: Forbes Street - East Hartford, CT FROM: Forest Street
DATE SAMPLED: Wednesday, June 25, 2014 TO: Margery Drive

CORE#: 30 ***Area:*** *2420' N. of Forest St., 4' off SBL curb (House # 771)*

	DEPTH mm	DEPTH inches	CLASSIFICATION	
	239	9.56	Hot Mix Asphalt (HMA)	
			Sandy Gravel	

CORE#: 31 ***Area:*** *2500' N. of Forest St., 4' off NBL curb (House # 763)*

	DEPTH mm	DEPTH inches	CLASSIFICATION	
	183	7.33	Hot Mix Asphalt	*Poor Bond @ 3.43"*
			Sandy gravel	

CORE#: 32 ***Area:*** *2580' N. of Forest St., Centerline (House # 757)*

	DEPTH mm	DEPTH inches	CLASSIFICATION	
	155	6.18	Hot Mix Asphalt	*Poor Bond @ 1.84", and 3.60"*
			Sandy Gravel	

CORE#: 33 ***Area:*** *2660' N. of Forest St., 6' off SBL curb (House 749)*

	DEPTH mm	DEPTH inches	CLASSIFICATION	
	105	4.21	Hot Mix Asphalt	
			Sandy Gravel	

CORE PROFILE

LOCATION: Forbes Street - East Hartford, CT FROM: Forest Street
DATE SAMPLED: June 25, 2014 TO: Margery Drive

CORE#: 34 ***Area:*** *2740' N. of Forest St., 3' off NBL curb (House # 749)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
			
127	5.08	Hot Mix Asphalt	
		Sandy gravel	

CORE#: 35 ***Area:*** *2820' N. of Forest St., Centerline (House # 737)*

DEPTH mm	DEPTH inches	CLASSIFICATION	
			
131	5.25	Hot Mix Asphalt	*Poor Bond @ 2.96"*
		Sandy Gravel	

CORE#: 36 ***Area:*** *2900' N. of Forest St., 3' off SBL curb (House # 731)*

DEPTH mm	DEPTH inches	CLASSIFICATION
		
108	4.31	Hot Mix Asphalt
		Sandy Gravel

VHB *Vanasse Hangen Brustlin, Inc.*

Pavement Engineering Services
Traffic Analysis and Classifications
Forbes Street
East Hartford, CT

LOCATION	DATE	HRS	LANE	TOTAL ADT	BIKES	CARS	2-AXLE LONG	BUSES	CLASS 5	6	7	8	9	10	11	12	13	% CLASS 5+
South of Silver	7/22/2014	24	NB	4467	46	3035	1120	30	199	12	0	24	0	1	0	0	0	5.28
Lane	7/23/2014	24	NB	4458	29	3035	1096	26	225	17	0	28	2	0	0	0	0	6.10
			Totals	**8925**	75	6070	2216	56	424	29	0	52	2	1	0	0	0	
			Percent of Total =		0.84	68.01	24.83	0.63	4.75	0.32	0.00	0.58	0.02	0.01	0.00	0.00	0.00	
			Percent of Trucks (Class 5+) =		**5.69**													
South of Silver	7/22/2014	24	SB	4684	23	3695	778	27	135	5	1	20	0	0	0	0	0	3.44
Lane	7/23/2014	24	SB	4698	24	3709	764	29	145	7	0	19	1	0	0	0	0	3.66
			Totals	**9382**	47	7404	1542	56	280	12	1	39	1	0	0	0	0	
			Percent of Total =		0.50	78.92	16.44	0.60	2.98	0.13	0.01	0.42	0.01	0.00	0.00	0.00	0.00	
			Percent of Trucks (Class 5+) =		**3.55**													
			AVERAGE TOTAL ADT =		**9154**													
			VEHICLE CLASS PERCENTAGE =		**0.67**	**73.46**	**20.63**	**0.61**	**3.87**	**0.23**	**0.01**	**0.50**	**0.02**	**0.01**	**0.00**	**0.00**	**0.00**	
			AVERAGE % CLASS 5+ =		**4.62**													
			% CLASS 5+ NB =		**60.4%**													
			% CLASS 5+ SB =		**39.6%**													

COMMENTS Traffic data collected between July 22, 2014 and July 23, 2014
by Accurate Counts - P.O. Box 38, North Reading, MA 01864

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product

Flexible Structural Design Module

Forbes - Forest to Margery Dr
EXISTING w/OVERLAY - 20

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	1,375,452
Initial Serviceability	4.8
Terminal Serviceability	2.5
Reliability Level	90 %
Overall Standard Deviation	0.44
Roadbed Soil Resilient Modulus	7,101 psi
Stage Construction	1
Calculated Design Structural Number	3.51 in

Effective Roadbed Soil Resilient Modulus

Period	Description	Roadbed Resilient Modulus (psi)
1	January	20,000
2	February	20,000
3	March	5,414
4	April	5,414
5	May	6,574
6	June	7,734
7	July	7,734
8	August	7,734
9	September	7,734
10	October	6,574
11	November	6,574
12	December	6,574

Calculated Effective Modulus 7,101 psi

Rigorous ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	9,154
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	100 %
Percent Trucks in Design Direction	60.4 %

Vehicle Class	Percent of ADT	Annual % Growth	Average Initial Truck Factor (ESALs/ Truck)	Annual % Growth in Truck Factor	Accumulated 18-kip ESALs over Performance Period
1	0.67	2	0.0001	0	33
2	73.46	2	0.0008	0	28,836
3	20.63	2	0.0052	0	52,638
4	0.61	2	0.97	0	290,335
5	3.87	2	0.32	0	607,657
6	0.23	2	0.905	0	102,135
7	0.005	2	2.14	0	5,250
8	0.5	2	1.115	0	273,553
9	0.02	2	1.19	0	11,678
10	0.005	2	1.36	0	3,337
11	0	2	2.485	0	0
12	0	2	1.29	0	0
13	0	2	2.695	0	0
Total	100	-	-	-	1,375,452

Growth: Compound

Total Calculated Cumulative ESALs: 1,375,452

Layered Thickness Design

Thickness precision: Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(in)	Min Thickness (Di)(in)	Elastic Modulus (psi)	Width (ft)	Calculated Thickness (in)	Calculated SN (in)
1	SuperPave 9.5 L1	0.44	1	1.25	-	440,000	-	1.25	0.55
2	Existing HMA/milled ...	0.28	1	6.4	-	175,000	-	6.40	1.79
3	GP-GM/Poorly Grade...	0.11	0.9	9.8	-	25,500	-	9.80	0.97
4	A24/Silty Sand (SM)	0.08	0.8	3.8	-	8,828	-	3.80	0.24
5	A24/Silty Sand (SM)	0.065	0.8	-	-	7,101	-	0.00	0.00
Total	-	-	-	-	-	-	-	21.25	3.56

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product

Flexible Structural Design Module

Forbes - Forest to Margery Dr
MILL / OVERLAY- 20 yr.

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	1,375,452
Initial Serviceability	4.8
Terminal Serviceability	2.5
Reliability Level	90 %
Overall Standard Deviation	0.44
Roadbed Soil Resilient Modulus	7,101 psi
Stage Construction	1
Calculated Design Structural Number	3.51 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	9,154
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	100 %
Percent Trucks in Design Direction	60.4 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	4.62 %
Average Initial Truck Factor (ESALs/truck)	0.60675
Annual Truck Factor Growth Rate	0 %
Annual Truck Volume Growth Rate	2 %
Growth	Compound
Total Calculated Cumulative ESALs	1,375,464

Layered Thickness Design

Thickness precision: Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(in)	Min Thickness (Di)(in)	Elastic Modulus (psi)	Width (ft)	Calculated Thickness (in)	Calculated SN (in)
1	SuperPave 12.5 L2	0.44	1	2	-	440,000	-	2.00	0.88
2	SP 12.5 L2	0.44	1	2	-	440,000	-	2.00	0.88
3	HMA/milled 4"	0.28	1	2.4	-	175,000	-	2.40	0.67
4	GP-GM/Poorly Grade...	0.11	0.9	9.8	-	25,500	-	9.80	0.97
5	A24/Silty Sand (SM)	0.08	0.8	3.8	-	8,828	-	3.80	0.24
6	A24/Silty Sand (SM)	0.065	0.8	-	-	7,101	-	0.00	0.00
Total	-	-	-	-	-	-	-	20.00	3.65

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product

Flexible Structural Design Module

Forbes - Forest to Margery Dr
RECLAMATION

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	1,375,452
Initial Serviceability	4.8
Terminal Serviceability	2.5
Reliability Level	90 %
Overall Standard Deviation	0.44
Roadbed Soil Resilient Modulus	7,101 psi
Stage Construction	1
Calculated Design Structural Number	3.51 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	9,154
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	100 %
Percent Trucks in Design Direction	60.4 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	4.62 %
Average Initial Truck Factor (ESALs/truck)	0.60675
Annual Truck Factor Growth Rate	0 %
Annual Truck Volume Growth Rate	2 %
Growth	Compound
Total Calculated Cumulative ESALs	1,375,464

Layered Thickness Design

Thickness precision Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(in)	Min Thickness (Di)(in)	Elastic Modulus (psi)	Width (ft)	Calculated Thickness (in)	Calculated SN (in)
1	SuperPave 12.5 L2	0.44	1	1.75	-	440,000	-	1.75	0.77
2	SP 12.5 L2	0.44	1	3.5	-	440,000	-	3.50	1.54
3	Reclaimed Silty Gravel	0.13	0.9	9.75	-	30,000	-	9.75	1.14
4	GP-GM/Poorly Grade...	0.11	0.9	5	-	25,500	-	5.00	0.50
5	A24/Silty Sand (SM)	0.08	0.8	0	-	8,828	-	0.00	0.00
6	A24/Silty Sand (SM)	0.065	0.8	-	-	7,101	-	0.00	0.00
Total	-	-	-	-	-	-	-	20.00	3.95

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product

Flexible Structural Design Module

Forbes - Forest to Margery Dr
REMOVE HMA / OVERLAY

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	1,375,452
Initial Serviceability	4.8
Terminal Serviceability	2.5
Reliability Level	90 %
Overall Standard Deviation	0.44
Roadbed Soil Resilient Modulus	7,101 psi
Stage Construction	1
Calculated Design Structural Number	3.51 in

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	9,154
Number of Lanes in Design Direction	1
Percent of All Trucks in Design Lane	100 %
Percent Trucks in Design Direction	60.4 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	4.62 %
Average Initial Truck Factor (ESALs/truck)	0.60675
Annual Truck Factor Growth Rate	0 %
Annual Truck Volume Growth Rate	2 %
Growth	Compound
Total Calculated Cumulative ESALs	1,375,464

Layered Thickness Design

Thickness precision Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(in)	Min Thickness (Di)(in)	Elastic Modulus (psi)	Width (ft)	Calculated Thickness (in)	Calculated SN (in)
1	SuperPave 12.5 L2	0.44	1	2	-	440,000	-	2.00	0.88
2	SP 12.5 L2	0.44	1	2.25	-	440,000	-	2.25	0.99
3	SP 12.5 L2	0.44	1	2.25	-	440,000	-	2.25	0.99
4	GP-GM/Poorly Grade...	0.11	0.9	9.8	-	25,500	-	9.80	0.97
5	A24/Silty Sand (SM)	0.08	0.8	3.7	-	8,828	-	3.70	0.24
6	A24/Silty Sand (SM)	0.065	0.8	-	-	7,101	-	0.00	0.00
Total	-	-	-	-	-	-	-	20.00	4.07

VHB/Engineering Services

BASE DESIGN COMPUTATION

Connecticut

TYPE: Forbes Reclaimed Miscellaneous Aggregate — Total Depth:
TP #: 2+3 — New Aggregate Depth:
Bit. Depth: 7.00 inches Base: 8.00 inches — Reclaim Depth: **15**

****** ********* MATERIALS**********

SIEVE SIZE	3/8" Stone 0.0%	1/2" Stone 0.0%	3/4" Stone 0.0%	1-1/4" Stone 0.0%	TP Subbase 0.0%	EST. RAP 46.7%	T.P. Base 53.3%	BLEND **100.0%**	SPECIFICATION Reclaimed Asph/Agg	SPECIFICATION Processed Aggregate Medium
3-1/2"	100	100	100	100	0	100	100	**100**	100	100
1-1/2"	100	100	100	100	0	80	97	**89**	55-100	100
3/4"	100	100	95	12	0	65	73	**69**	-	75-100
1/4"	28	12	4	0	0	35	56	**46**	25-65	30-60
#10	4	0.7	1.5	0	0	20	48	**35**	15-50	-
#40	1	0	0	0	0	9	37	**24**	5-30	10-25
#100	0.7	0	0	0	0	5	18	**12**	0-15	3-12
#200	0	0	0	0	0.0	2	9.7	**6**	0-8	-

TYPE: Reclaimed Miscellaneous Aggregate — Total Depth:
TP #: Blending TPs for average gradation — New Aggregate Depth: 0
Bit. Depth: 5.00 inches Base: 5.00 inches — Reclaim Depth: **10**

****** ********* MATERIALS**********

SIEVE SIZE	3/8" Stone 0.0%	1/2" Stone 0.0%	3/4" Stone 0.0%	1-1/4" Stone 0.0%	2" Stone 0.0%	**TP 1+4+7+8 50.0%**	**TP 2+3 50.0%**	BLEND **100.0%**	SPECIFICATION Reclaimed Asph/Agg	SPECIFICATION Processed Aggregate Medium
3-1/2"	100	100	100	100	100	100	100	**100**	100	100
1-1/2"	100	100	100	100	50	89	89	**89**	55-100	100
3/4"	100	100	95	12	3	76	69	**73**	-	75-100
1/4"	28	12	4	0	0	52	46	**49**	25-65	30-60
#10	4	0.7	1.5	0	0	41	35	**38**	15-50	-
#40	1	0	0	0	0	29	24	**27**	5-30	10-25
#100	0.7	0	0	0	0	14	12	**13**	0-15	3-12
#200	0	0	0	0	0	6	6	**6.1**	0-8	-

TYPE: Reclaimed Miscellaneous Aggregate — Total Depth:
TP #: 1+4+7+8 — New Aggregate Depth:
Bit. Depth: 7.00 inches Base: 8.00 inches — Reclaim Depth: **15**

****** ********* MATERIALS**********

SIEVE SIZE	3/8" Stone 0.0%	1/2" Stone 0.0%	3/4" Stone 0.0%	1-1/4" Stone 0.0%	TP Subbase 0.0%	EST. RAP 46.7%	T.P. Base 53.3%	BLEND **100.0%**	SPECIFICATION Reclaimed Asph/Agg	SPECIFICATION Processed Aggregate Medium
3-1/2"	100	100	100	100	0	100	100	**100**	100	100
1-1/2"	100	100	100	100	0	80	97	**89**	55-100	100
3/4"	100	100	95	12	0	65	86	**76**	-	75-100
1/4"	28	12	4	0	0	35	66	**52**	25-65	30-60
#10	4	0.7	1.5	0	0	20	60	**41**	15-50	-
#40	1	0	0	0	0	9	47	**29**	5-30	10-25
#100	0.7	0	0	0	0	5	23	**14**	0-15	3-12
#200	0	0	0	0	0.0	2	9.7	**6**	0-8	-

Comments:

Used slightly over the average HMA because I think the TP HMA thicknesses are high compared to the core results.

LOCATION: Forbes Street

Section	Area (ft^2)	PCI	% area	PCI weight
? ?	?		#VALUE!	#VALUE!
? ?	?		#VALUE!	#VALUE!
? ?	?		#VALUE!	#VALUE!
? ?	?		#VALUE!	#VALUE!
? ?	?		#VALUE!	#VALUE!
? ?	?		#VALUE!	#VALUE!
? ?	?		#VALUE!	#VALUE!
? ?	?		#VALUE!	#VALUE!
? ?	?		#VALUE!	#VALUE!
? ?	?		#VALUE!	#VALUE!

	Max	Base	Surface
Potholes (1)			
Alligatoring (2)			
Distortions (4)			
Rutting (3)			
Weather/Block (5)			
Trans/Long (6)			
Bleeding (7)			
Raveling (8)			
Corrugations (9)			
Sumations:	0	0	0

PCI Calc: = 100 - Max - .25*(Sum Base) - .10*(Sum Surface)

	Minor			Moderate			Severe		
	L	M	H	L	M	H	L	M	H
Potholes (1)	5/10/15			10/20/30			20/30/40		40/45/50
Alligatoring (2)	5/10/15			10/20/30			20/30/40		35/40/50
Distortions (4)	5/10/15			10/20/30			20/30/40		25/35/45
Rutting (3)	1/15/20			10/25/35			15/35/45		20/40/50
Weather/Block (5)	1/5/10			10/15/20			15/20/25		30/35/35
Trans/Long (6)	1/5/10			5/10/15			15/20/25		20/25/25
Bleeding (7)	1/5						10/35		
Raveling (8)	2/5						6/10		
Corrugations (9)	1/15						25/35		

area 0 #VALUE! **#VALUE! PCI** **PCI=** **100**
length ?
width #VALUE!
sy 0

Core Number	Core Thickness	
1	7.07	5.15
2	6.31	4.99
3	6.47	5.25
4	6.85	8.27
5	6.64	5.02
6	4.05	5.24
7	7.31	8.56
8	6.04	5.64
9	5.39	4.49
10	4.72	5.57
11	5.44	9.56
12	4.53	7.33
13	5.34	6.18
14	6.08	4.21
15	6.58	5.08
16	5.6	5.25
17	5.53	4.31
18	5.59	
19	5.59	

TEST PITS & CORES	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**AVG**	**LOW**	**HIGH**
HMA Total	**6.50**	**10.00**	**12.00**	**5.00**	**9.00**	**10.00**	**8.00**	**9.00**	**7.00**	**6.39**	4.05	12.00
HMA Surface	6.50	10.00	12	5	9	10	8	9	7	**6.39**	4.05	12.00
HMA Intermediate										**PB @ 3.03"**		
HMA Base												
Base (inches)	7.5	8.5	8	9	12	10	12	10	11	**9.78**	7.50	12.00
Classifications	SPSM/A1b	GPSM/A1b	GPSM/A1b	SPSM/A3	GW/A1a	GP/A1a	SPSM/A1b	SPSM/A1b	GP/A1a	**Grading "A" Gravel**		
% Silt	10	10	9.3	8.3	4.9	4.9	8.5	12	4.7	**8.1**		
Subbase (inches)											0.00	0.00
Classifications												
% Silt												
Subbase (inches)											0.00	0.00
Classifications												
% Silt												
Subgrade (inches)	17	14.5	13	16	12	11	10	12	12	**13.06**	10.00	17.00
Classifications	SM/A24	SM/A24	SM/A24	SPSM/A3	SM/A24	SM/A24	SM/A24	SPSM/A24	SPSM/A3	SM ~~SPSM/A3~~ A-2-4		
% Silt	24	18	18	10	20	18	23	11	10	**16.9**		
										AVG.	**STD. DEV.**	**Alternative #1 DESIGN Mr (60% AVG. Mr)**	**Alternative #2 DESIGN Mr (AVG. Mr - STD.)**
DCP @ 5 blows (in.)	5.00	4.50	5.00	4.00	4.00	5.00	4.50	4.00	4.50	**4.50**			
CBR	5.5	6.8	5.5	8.6	8.6	5.5	6.8	8.6	6.8	7			
Mpa	53	60	53	70	70	53	60	70	60				
M_R	7,621	8,722	7,621	10,141	10,141	7,621	8,722	10,141	8,722	**8,828**	**1,094**	**5,297**	**7,734**

REMARKS

Effective Mr	@60%	@Avg.
@ 70%	3,708	5,414
@ 85%	4,502	6,574
@ 100%	5,297	7,734